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ABSTRACT

The U.S. Army is in the process of implementing the Army Distance Learning Program, which is intended to improve training effectiveness and efficiency by substituting distance learning (DL) for portions of its current resident instruction program. To determine the potential effectiveness of DL in delivering military training, 25% of the resident portion of the Armor Captains Career Course was converted to DL and the time allotted to that portion of the course sequence was reduced by 30%. The revised course consisted of a 16-day DL phase and a 94-day resident phase. With that course structure as a basis, four alternatives to the current practice that involved different combinations of permanent change of station (PCS) and temporary duty status (TDY) were explored. Depending on the mix of PCS and TDY status, the four options increased the time on home station from 32 to 43 days per officer and yielded a minimum estimated increase of 8-15 available duty days. The effect on trainees' well-being varied among the options. Three of the four options were slightly more expensive than the existing training system; however, DL conversion enhanced stability by keeping soldiers in their units longer. (Fourteen tables/figures and 11 references are included.) (MN)

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Enhancing Stability and Professional Development Using Distance Learning

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PREFACE

The Army has established a program to implement distance learning throughout both its Active and Reserve Component training systems and institutions. At the request of the Army's Deputy Chief of Staff for Personnel (DCSPER), RAND Arroyo Center undertook a research project entitled "Personnel Policy Implications of Army Distance Learning." The goals of this effort were to help the Army maintain readiness and manage personnel efficiently as it implements the various features of The Army Distance Learning Program (TADLP). In the first year of our effort, we presented findings analyzing the implications of TADLP for personnel policy; that analysis documented the need to examine further some of the ways to capitalize on distance learning to enhance various aspects of readiness.

This report, one of two documenting the results of the research, examines the effect of distance learning on soldier stability and professional development. The other report is *Army Distance Learning: Potential for Reducing Shortages in Enlisted Occupations,* Michael G. Shanley, Henry A. Leonard, and John D. Winkler, MR-1318-A, 2001. This research should interest Army and defense policymakers and others responsible for training and human resources development in large, geographically dispersed organizations.

The research was carried out in RAND Arroyo Center's Manpower and Training Program. The Arroyo Center is a federally funded research and development center sponsored by the United States Army.

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SUMMARY

BACKGROUND AND PURPOSE

The Army is in the process of implementing The Army Distance Learning Program (TADLP). Its intent is to substitute distance learning (DL) for portions of current resident instruction, with an eye to improving the effectiveness and efficiency of training. Implementation of this program will have a wide-ranging effect on how the Army trains and develops its leaders. It will directly affect how the Army goes about achieving three of its major goals: Manning the Force and Investing in Quality People, Maintaining Unit Readiness and Training, and Training and Leader Development. These are Lines of Operation 3, 4, and 5 specified in the Army's Transformation Campaign Plan. Since the personnel community plays a key role in achieving these goals, the Deputy Chief of Staff for Personnel (DCSPER) asked RAND Arroyo Center to examine some of the potential implications of DL for personnel readiness. This document provides the results of one portion of that analysis: the potential for DL to enhance stability and professional development of the Army's soldiers and leaders. Although this research was done for the Army's personnel community, the distance learning program and its implementation are of interest to the Army and the national defense community at large, and not just to those directly concerned with training or personnel management.

APPROACH

The research focused first on one officer course, the Armor Captains Career Course, to determine the potential effects of DL. Captains

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career courses have two components: a branch-specific advanced course, taught at the branch school, and the Combined Arms and Service Support School (CAS3), taught at Fort Leavenworth, which is a course for junior staff officers of all branches. The Army already offers a Reserve Component (RC) Armor Officer Advanced Course that is almost totally conducted by DL, having only a two-week resident phase. The current pattern for the Active Component (AC) career course includes a resident advanced course phase of eighteen weeks, a six-week phase at Fort Leavenworth where the students take the CAS3 course, and, for most students, a three-week tank or cavalry troop commander's course at Fort Knox. For the Active Component career course, we looked at the effects of converting 25 percent of the resident portion of the advanced course segment to DL, and reduced the time allotted to that portion of the course sequence by 30 percent. Applying these factors to the Armor Officer Advanced Course results in a 16-day DL phase and a 94-day resident phase. With this course structure as a basis, we explored four alternatives to the current practice. The alternatives explore different combinations of permanent change of station (PCS) and temporary duty (TDY) status to determine a range of possible effects on time at home station (i.e., increasing stability) and some of the relevant costs. Once we completed the analysis of the Armor Captains Career Course, we then extended the results of that analysis to other career courses and other types of courses.

RESULTS

For each option, we determined how much total time at home station increased, i.e., how much less time the student would spend away at school. But since some of the time at home station must be devoted to the DL instruction, we calculated the amount of time DL studies would take and derived a second figure, subtracting DL study time to get a measure of how much additional time could be available to units. We also calculated a minimum figure for availability. This figure is based on a strict assumption that the student would be unavailable to the unit during any of the time devoted to DL. In practice, it is likely that a DL student could participate in some unit activities with no detriment to the DL study, even when concentrating on DL.

The four options increase the time on home station from 32 to 43 days per officer depending on the mix of PCS and TDY status. Stripping out the time necessary for DL yields between 16 and 27 additional days available to the unit. Using conservative assumptions, we also derived a minimum estimated increase of between 8 and 15 available duty days, again depending on the PCS/TDY mix chosen. These figures, when generalized to the Army's population of captains bound for career courses each year, indicate an increase of 300 to 340 available man-years (using the overall time-on-station measure) and between 115 and 135 working man-years (using our minimum measure). Since availability of captains is currently a significant issue for the Army, we regard these benefits as significant. The effect on well being (specifically, time available at home with families and friends) varies among options. If the entire course is done in a TDY status, the officer spends much more time away from his or her family than with the current course, which is done in a PCS mode, with the family accompanying the officer.

Although we did not undertake a full-fledged comparative cost analysis of the Army's institutional training programs, we did estimate the travel and PCS costs associated with our various DL options. These costs do not vary much from the current practice of a combination of PCS and TDY. Three of the four options considered are more expensive than the current one, but only slightly so. The primary difference is that these options involve significantly more TDY, and the TDY expenses more than offset the savings from reducing PCS moves.

EXTENDING THE ANALYSIS

Extending the analysis to other courses done in a TDY mode only, we find that the broad findings from the Armor Captains Career Course hold true: DL conversion enhances stability by keeping soldiers in their units longer. For example, applying the analysis to the Basic Noncommissioned Officers Course for Artillery Fire Support Specialists shows a maximum increase in days available of 26 days and a minimum of an additional 7 days, again on a per-student basis. Other courses such as reclassification training or short-duration courses also show benefits. But since benefits are generally proportionate to course length, shorter courses naturally yield smaller

benefits. Overall, we estimate on-station man-year increases to be just under 2,400, with an increase in available work-years (our minimum measure) of about 840.

CONCLUSIONS AND RECOMMENDATIONS

Converting portions of the Army's resident courses to DL gives soldiers more time with their units and, in general, with their families and friends as well. Summing across all courses we looked at that could convert some portion of the instruction to DL, we get an estimate of between 2,700 and 2,800 additional man-years on home station, of which a significant portion must be devoted to the DL training. Still, the units experience a net gain in leader presence, about 950 to 1,000 working man-years by our minimum estimates. This represents just less than 5 percent of the estimated man-years devoted to schooling each year; because of our methodology we believe this is a conservative estimate. Conversion to DL offers some savings in TDY costs as well, in those cases where the resident portion of a TDY course can be shortened.

We recommend that the Army continue to pursue the options it is examining for bringing DL modules into its officer advanced courses and thereby reducing the overall duration of these courses. We also recommend that the Army retain the PCS variant of these courses since it is no more expensive than TDY variants and avoids significant increases in family separations. If avoiding family moves is enough of a concern for some of these officers, the Army could experiment with a pilot program in which some officers might be allowed to take the course on a TDY basis. This will raise costs slightly relative to alternatives where the course is done on a PCS basis, but it may be worthy of experimentation. We further recommend that the Army concentrate more DL program efforts on developing courseware first for TDY professional development courses that appear to have larger stability and savings payoffs.

On a broader front, we recommend that the Army explore more fully the numerous additional ways of capitalizing on emerging DL technology. The Army already sees DL as a key enabler for its initiatives to enhance education opportunities for first-term soldiers; the same could be done to expand education opportunities for officers and NCOs as well. Other potential ways to capitalize on DL include pro-

viding "just in time" training for both units and individuals, short modules for skill refreshers or upgrades, and job aid packages that could be integrated into staff training programs.

Finally, we observe that a significant degree of caution is needed in implementing the various features of TADLP. Adapting field units and organizations to a program that requires home study will be a challenge, and we view the requirement for dedicated study time as key to the success of the DL program. More also needs to be known about the comparative costs of the overall program. Savings, to the extent they will accrue, are still largely in the future. Moreover, some types of savings (e.g., TDY) are more predictable than others (e.g., instructors and staff, who will still be needed to support DL phases as well as resident phases). The Army has produced economic analyses that estimate savings from the DL program, but more needs to be known about the actual achievement of these savings as the program is implemented: their magnitude, the form they take, and their relationship to the hardware and facilities costs associated with DL implementation. Thus, we recommend that the Army closely monitor the interaction of its DL program with the overall costs of institutional training programs. This will enable better focus on the best possible payoffs for both DL and residential training.

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GLOSSARY

AC	Active Component
ANCOC	Advanced NCO Course
AT	Annual Training
ATRRS	Army Training Requirements and Resources System
BNCOC	Basic NCO Course
CAS3	Combined Arms and Service Support School
CCC	Captains Career Course
CONUS	Continental United States
DCSOPS	Deputy Chief of Staff for Operations and Plans
DCSPER	Deputy Chief of Staff for Personnel
DL	Distance Learning
DoD	Department of Defense
FY	Fiscal Year
IET	Initial Entry Training
MOS	Military Occupational Specialty
PCS	Permanent Change of Station
RC	Reserve Components
RL	Resident Learning

QOL	Quality of Life
TADLP	The Army Distance Learning Program
TCP	Transformation Campaign Plan
TDY	Temporary Duty
TOS	Time On Station
TRADOC	Training and Doctrine Command
TTHS	Trainees, Transients, Holdees, Students

Chapter One

INTRODUCTION

BACKGROUND

The Army has established The Army Distance Learning Program (TADLP) under the auspices of the U.S. Army Training and Doctrine Command (TRADOC). The intent of this program is to capitalize on the capabilities of distance learning (DL) technology to replace resident instruction with DL in those cases where the material can suitably be taught using DL. In effect, this means dividing existing courses into resident learning (RL) and DL phases or modules. Typically, the DL portions of the overall course are prerequisites for follow-on residential instruction. Thus, TADLP will significantly change how individual training is conducted—how leaders and soldiers are developed—both in institutions and in the field.

The Army is pursuing these changes because it believes a number of benefits accrue from DL. These benefits amount to direct or indirect enhancements to training and personnel readiness. DL has potential for delivering targeted training on short notice, can facilitate access to education, and may provide more timely training than a resident course. At the same time, as technology can enhance the speed of learning, course lengths can decrease, and soldiers may spend less time away from their units and less time between operational assignments. Some resource savings may also be possible as the resident training loads on schools decrease. These could take the form of reduced travel costs and reductions in instruction and support staffs, although the latter will be offset by requirements for instructors and support in the DL courses.

Several key features of the DL program determine how it will affect training, the soldiers and leaders being trained, and their units. First, some training will move away from the traditional schoolhouse and closer to where soldiers reside, making the training easier to schedule and deliver. Second, DL can leverage emerging educational technology and media to provide increased access to training material and to deliver the training. Third, by reducing the need for soldiers to leave their units for RL courses elsewhere and by providing significant amounts of training in asynchronous modes,[1] DL provides the potential for increasing flexibility and continuity in the timing of training. Finally, because it moves some training out of directly supervised classrooms and school environments, DL increases the responsibility of soldiers and their chain of command for ensuring timely completion of training.

While the distance learning program is under the purview of the Army's training community—primarily TRADOC and the Army's Deputy Chief of Staff for Operations and Plans (DCSOPS)—the program has broader implications for the Army as a whole. TADLP will directly affect the ways the Army will achieve three of its major goals. These goals, identified as Lines of Operation 3, 4, and 5 in the Army's Transformation Campaign Plan, are

- Manning the Force and Investing in Quality People,
- Maintain Unit Readiness and Training, and
- Training and Leader Development.

These areas directly concern the Army's personnel and training communities, i.e., the DCSPER, the DCSOPS, and TRADOC. But because of DL's potentially wide-reaching effects in all these areas, the Army as a whole has a significant stake in the development of the distance learning program and the direction it takes.

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[1] In synchronous distance learning, the students are connected with an instructor while the instruction is being presented. They may also be connected with one another. In asynchronous DL, the students work on the course material at a time they choose; they need not be directly connected with anyone else.

RESEARCH FOCUS AND PURPOSE OF THIS REPORT

The features of DL discussed in the preceding paragraph indicate that TADLP can significantly affect the Army's personnel readiness through its impact on the methods, scheduling, timing, and time required for delivery of training. We undertook research for the DCSPER to examine some of those potential personnel readiness implications. In the process, we developed analysis that should help both the personnel community and the Army at large in evaluating DL's potential and ways to capitalize on it. This report and a companion one[2] on the applications of DL to redressing manpower shortages present the results of our research. While our particular focus was on selected personnel development and readiness implications of the DL program for the Army, we believe the conclusions we draw apply to personnel training and development programs in general.

In this research, we start with discussions of ways in which DL can affect personnel readiness. Because we are looking in particular at the potential for DL to help maintain or improve readiness by keeping soldiers in their units longer, we look at the challenge of stability enhancement in an overall perspective. We then move to a more detailed discussion of how changes in institutional training patterns, enabled by DL conversions, can help the Army enhance stability. We also point out some potential resource implications of DL conversions. We include at the end of the report a broader discussion of DL's potential, drawing on observations already made and on additional insights we gathered during our research.

As we have suggested above, the personnel implications of TADLP (and thus a significant part of the Army's stake in the program) boil down to readiness: can TADLP help to enhance the personnel readiness of the Army? Many of the features of DL—chief among them shorter overall training time, the availability of "on-demand" training packages, and greater flexibility in scheduling—can enhance personnel readiness if judiciously employed.

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[2]Michael G. Shanley, Henry A. Leonard, and John D. Winkler, *Army Distance Learning: Potential for Reducing Shortages in Enlisted Occupations*, Santa Monica, CA: RAND, MR-1318-A, 2001.

We look at personnel readiness at three levels: Army-wide, organizational, and individual. Army-wide personnel readiness depends on the overall natural abilities, training and education, and morale of the Army's people (these are also components of individual readiness) and on the Army's ability to develop, train, position, and motivate them to accomplish their assigned missions. Organizational readiness includes the above considerations and looks more specifically at the degree to which the skills and qualifications of the soldiers in units and organizations match the skill and qualification requirements specified for those units and organizations. Of the three forms of readiness, this is the easiest to quantify: improving the match between the skills of the soldier inventory and the requirements of the organization improves organizational readiness.[3] Individual readiness—the skills, training level, general aptitude, and motivation/morale of each individual—is the foundation for the two collective forms of readiness.

DL programs can influence personnel readiness at all three levels, and this research project has examined the effect of DL at each. For example, the first segment of our research examined ways DL can help the Army more quickly address manpower shortages in understrength skills. It looked at the potential for DL to enable faster completion of reclassification training, faster promotion qualification, and more efficient forms of additional skill training. Success in these areas would improve the skill mix component of the Army's overall readiness posture[4] and, in turn, also improve the skill content in units and organizations, enhancing organizational readiness. The organizational effect depends also on judicious distribution of the additional trained soldiers into units and organizations where there are shortfalls: DL enables better organizational readiness but does not by itself lead to such improvements.

In addition, DL programs have the potential to reduce the time soldiers spend away both from unit duties and from their families, thus enhancing stability in units and quality of life—well being—for

[3]The Army uses statistical measures of this match as part of its unit readiness assessments. The Army also separates organizational readiness into two separate categories: institutional and unit. The personnel readiness effects of DL would be similar for both.

[4]That is, bring the manpower fill in each skill area closer to requirements.

soldiers and families. This report—the second segment of our research—is devoted primarily to a closer look at these effects. The fundamental premise here is that increasing the amount of time soldiers are available to their units will enhance overall readiness. This premise is supported by the fact that turbulence—the rapidity of soldier and especially leader turnover in the Army's organizations—is an item of interest in readiness reporting and discussions at all levels of the Army. We treat turbulence in more detail in subsequent discussions. A second premise is that improving quality of life for soldiers and families will more subtly improve readiness by improving morale and retention.

We also look at some of the ways the DL program could help overall individual readiness, not only by improving skill qualifications and quality of life, but also by enriching leader development and expanding other opportunities for personal and professional development. Individual readiness is difficult to quantify: such measures as test scores, education levels achieved, and skill training accomplished are helpful but not wholly comprehensive indicators. Our premise here is that enriching leader development and enhancing opportunities for other forms of personal and professional development will enhance individual readiness by producing better-trained and educated soldiers and leaders. The Army's recent initiative to give soldiers access to Web-based civilian education and skill certification programs is an example of the potential contribution that DL can make to individual readiness. We will look at some other examples of DL's potential in this area.

DL AND THE QUALITY OF TRAINING AND EDUCATION

While we do not purport to offer a full analysis of the desirability of replacing classroom training with DL, we do believe some discussion of this important issue is warranted. DL's introduction will bring about large and fundamental changes, technically, organizationally, and culturally, in how training (particularly but not only institutional training) is conducted. Viewed in this way, DL clearly poses some risks to the quality of training, especially during the transition period. Careful implementation and monitoring will continue to be key to maintaining training quality and achieving desired learning out-

comes. This in turn will require continued emphasis and support throughout the Army.

Our analyses in this report and in its companion report carry with them an assumption that DL's potential can be fully realized in many of the Army's training programs without reducing the quality of training. This means DL initiatives must be implemented with due concern for retaining the benefits of residential learning where appropriate, and with careful selectivity in determining which portions of a given training program should be taught using DL. Judgments about DL conversion should also take into account some of the more intangible, but nevertheless real, benefits that RL conveys by allowing soldiers to associate in an academic environment with their peers and with subject matter experts.

The foregoing implies that the superiority of DL should not be taken for granted. On the other hand, we note that a considerable volume of past research supports the contention that DL can provide training as effectively as the classroom training it replaces, and possibly more efficiently in some cases. For example, Phelps et al. (1992) found that knowledge gained in engineering and leadership courses offered to a group of Reserve Component officers was at worst not significantly different between RL and DL groups.[5] Along the same lines, in a test of distance versus resident education on selected subjects from the Army Command and General Staff Officers Course, Keene and Cary (1992, p.102) found that "students who received the distance learning instruction evinced superior knowledge of the subject matter at the end of the instruction."[6] Similarly, Farris et al. (1993) found that computer-based training could be used effectively

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[5]Specifically, students' self-ratings of knowledge improvement would support a finding of better learning in the DL engineering course. The DL group also had higher performance test scores than the RL group, but the difference was not statistically significant ($p > .05$, thus the "at worst" in the text above). Performance scores in the leadership course were significantly higher for the DL group. The authors noted higher attrition in the DL group as well—this will be a continuing item of concern for unit commanders and institutional training managers. Phelps et al. (1992), pp. 113–125.

[6]Better than the RL group on three of four posttests, with $p < .001$ on two of these. On the fourth, the RL group scored slightly better but the difference was not statistically significant. Keene and Cary (1992), pp. 97–103.

in teaching many of the skills required for artillery fire direction specialists.

More generally, studies of various forms of DL have pointed toward a tradeoff between superior performance and reduced training time, compared with the RL courses they are designed to replace. Orlansky and String (1979) make this point in a paper looking at the results of some 30 studies of the effects of DL on military training.[7] In particular, they note (p. 42) that in most of these studies the principal effect of DL is a reduction in overall time needed to master the required skills. "The fact that student achievement . . . is about the same as that with conventional instruction is also a direct consequence of the fact that students . . . are held in these courses until they master all lessons. The critical variable thus becomes the amount of time needed to complete the courses . . . " The authors go on to point out that in the studies they examined, median time savings were on the order of 30 percent, with only three of the courses actually requiring increased time. They observe that one likely reason for this effect is that the DL instruction is self-paced, so students must only spend as much time as needed to achieve a given performance standard.[8]

Two other observations are worthy of mention in the context of the previous discussion. First, a key reason why DL instruction has been shown to be at least as effective as RL is that the right choices were made in the beginning about what should be taught using DL, and the right amount of attention was paid to the quality of the DL materials. Second, since appropriate use of DL can reduce training time, training managers and the Army leadership are going to be presented with a large number of choices about the tradeoff between reduced training time and improved training effectiveness. These choices will be complicated by the desire in some cases to capture the values of group discussion and close interactions with expert instructors, none of which can be provided as effectively with DL as they can with RL. Thus, we note again that training managers must continue to be

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[7]Orlansky and String (1979) provides an in-depth treatment. More condensed discussions of the same general observation can be found in two other articles: Orlansky and String (1981) and Orlansky (1983).

[8]Orlansky and String (1979), pp. 42–48.

judicious in selecting course segments for conversion to DL, and that the quality of DL courseware must be assured. Also, as with any RL curriculum, periodic refinement and adjustment of DL course content will be necessary to maintain currency. In the next paragraphs we note some other areas where continued attention will be needed to uphold the overall quality of training and education as DL programs are introduced.

As mentioned earlier, taking residential time out of courses reduces opportunities for interaction among students and between students and instructors. Many of the Army's RL courses, especially professional development courses, have important group process–oriented collaborative requirements. Losing these components in a DL-supported course could decrease training quality. Some collaboration and group interaction can be built into DL segments of these courses, and consultations with instructors need not always be face to face (they aren't always in RL environments, either). But interactions over electronic media cannot fully substitute in every case for the value of direct personal contact. Also, reducing the length of residential training in some courses will reduce the opportunity for the Army's developing leaders to network with one another. While networking does not contribute directly to training quality per se, it does develop trust and confidence among peers that can enhance their effectiveness in their subsequent careers when they may again be called on to work together. This can legitimately be considered a value of institutional training. The key to maintaining the overall effectiveness of the training program, then, is to retain those aspects of direct interaction that cannot be replaced and to utilize fully the potential of new distance learning technologies to enable quality collaboration and interaction where needed. Application of this principle means there will be clear limits to the degree of DL conversion that would be appropriate.

Another key element of training effectiveness will be the roles of the student, the local commander, supporting installation activities, and the proponent schools. By moving more instruction out of directly supervised residential training environments and into the field, DL increases the responsibility of soldiers and their chains of command for ensuring that training standards are met in a timely manner, but the schools will still play an important role even during DL phases. DL creates a need for new or modified forms of support, e.g.,

"fenced" study time for students at home station, e-mail or Web-based academic aid and supplemental tutorial materials, periodic feedback for students, instructor help lines, and control of performance testing materials. Also, while it may be possible to operate DL phases of courses with somewhat less administrative support, some of this kind of support (e.g., scheduling, enrollment, record keeping, certification) will still be required. Failure to provide adequately for these details in DL-supported courses can lead to higher attrition, longer completion times, insufficient learning or retention of important material, and ultimately a lower quality of training.

In summary, while we hold in this report that DL can maintain high training quality, we also recognize that replacing resident learning with distance learning, if done improperly, can lower training quality. In particular, we note the importance of avoiding the following implementation pitfalls:

- Choosing inappropriate course segments for conversion
- Using inappropriate or outdated instructional media
- Failing to make sufficient changes to existing processes and support activities to support DL's requirements
- Failing to provide adequate resources
- Providing insufficient incentives for students, commanders, and supporting activities to play their proper roles.

HOW THIS REPORT IS ORGANIZED

The next chapter of this report discusses the issues of turbulence and its flip side, stability. Chapter Three turns to an analysis of one specific type of course, officer career courses, and whether DL would increase stability and at what cost. Chapter Four extends the analysis to other types of courses. The core of the analysis in Chapters Three and Four is our examination of the additional days that soldiers can be available at their home stations. We will also discuss some of the relevant cost factors and provide estimates of some possible modest cost reductions. Chapter Five provides a broader discussion of DL's potential, drawing on observations already made and offering additional insights gathered during our research. Chapter Six summa-

rizes our stability enhancement findings and presents conclusions, recommendations, and some cautions.

THE PROBLEM OF TURBULENCE

Reducing turbulence and enhancing stability are opposite sides of the same coin: anything that reduces turbulence enhances stability. Turbulence is a readiness problem for the Army because the more frequent the turnover of unit personnel, the less chance there is to develop cohesion and teamwork, thought to be key elements of an effective unit. Shorter tenure in any given position (i.e., more rapid turnover) also limits the development of expertise in that position and reduces as well the experience base on which skills are built for future, more senior positions. In other words, within reasonable limits, the longer a soldier or leader remains at a given station and in a given position, the better.

Although not as easily captured in the aggregate, soldier and leader absences from their assigned positions have effects essentially the same as those just discussed: disruption of cohesion and teamwork, erosion of the experience base. In many cases, in fact, these kinds of absences can be even more disruptive, since a permanent departure usually (but not always) coincides closely with the arrival of a replacement.

Turbulence affects the well being of all the Army's people, not just its soldiers. The effects of DL on family separations are somewhat ambiguous. For example, shortening a course and converting it from an accompanied station change to an unaccompanied temporary duty (TDY) might make soldiers more available to their units (i.e., if the course duration is shorter), but it would increase the amount of time soldiers would be separated from their families. In other cases, e.g., shortening courses that are already done in TDY mode, the effects

would be more clear-cut: more time available both to units and to families. We shall discuss these implications in more detail.

As suggested in the previous discussion, a common measure of turbulence (and thus of stability) is average time on station (TOS). This is particularly true because turbulence is perhaps most commonly associated with permanent change of station (PCS) moves. More PCS moves mean more turbulence; conversely, longer TOS between moves means more stability. But permanent changes of station are not the only manifestations of turbulence. The previous discussion also notes that absences for school attendance contribute to turbulence, as do taskings (either internal or external) that take soldiers away from their assigned duties. Finally, some additional turbulence occurs internal to units or installations as soldiers and leaders move from one position to another to fill vacancies caused by departures of others or to progress professionally in their fields.

Some additional points regarding turbulence warrant mention. First, the optimum amount of turbulence is not zero (which is infeasible) or even close to zero: an Army with near-zero turbulence is a stagnant one with limited upward or lateral mobility and few opportunities for broadening or advancement. Thus, too much stabilization can keep soldiers from the assignments and experience they need to grow into effective leaders at more senior positions.[1] Second, not all forms of turbulence can be alleviated by the introduction of DL-supported training. Requirements imposed from outside the unit will continue, unaffected by DL. Also, units and installations will continue to have internally generated moves, although their frequency may decline somewhat as the effects of DL work to increase the amount of time soldiers can spend in each assignment.

THE RECENT TIME ON STATION (TOS) PICTURE

Figure 2.1 provides perspective on the Army's trends in stability. Each bar represents the average time on station (i.e., the time between PCS moves) for each general category in fiscal years (FY) 1997

[1]For a full treatment of the factors and polices that drive the Army to move large numbers of soldiers, see Hix et al. (1998).

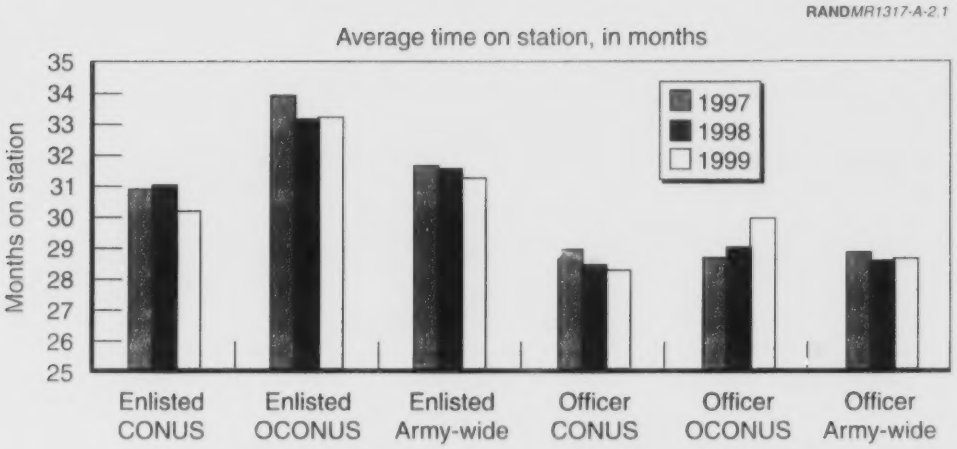

Figure 2.1—Number of Months on Station, 1997–1999

through 1999.[2] The general trend is slightly downward, with officers spending less than 29 months on station and enlisted personnel somewhat over 31 (for FY99).

This figure shows a reasonable estimate of PCS-induced turbulence, but it should not be construed to mean that soldiers are at their home stations continuously for the periods indicated. Training and operational deployments are not reflected in the TOS figures. Nor do these figures reflect the turbulence induced by school attendance. The personnel account for trainees, transients, holdees, and students (TTHS) indicates some of the soldier absences from units resulting from school attendance. That account reflects upward of 12,000 student man-years for officers and enlisted personnel as students.[3] This figure excludes any time for soldiers participating in Initial Entry Training (IET), which would not be affected by the DL alternatives we are examining in this research. However, the figure also excludes student man-years for courses in which the student returns to the same unit when the course is completed; these man-years would be

[2]Based on PCS and time on station data provided by the Army's Personnel Command (PERSCOM). Data do not include time spent in PCS schools, which would have given the figures—particularly for officers—a misleading downward bias. Monthly figures were averaged for each year.

[3]DCSPER 170 Report through May 2000.

affected and thus should be included in our DL comparisons. We estimate that about another 7,000 student man-years are devoted annually to these TDY-and-return courses.[4] Thus, our estimated basis for comparison of total student man-years is in the neighborhood of 19,000–20,000 each year.

TURBULENCE: GOOD AND BAD

Turbulence is a stubborn problem. Having already noted that zero turbulence is inherently undesirable—and infeasible—we also observe that many measures that might reduce turbulence to "better" levels would be distasteful in other ways. Much of the turbulence related to PCS moves, for example, comes from the need to replace soldiers returning from overseas. Increasing overseas tour lengths would therefore reduce turbulence, but this beneficial effect is offset by the possibility that longer overseas tours would be unpopular and thus damaging to morale and, ultimately, retention. Moreover, changing overseas tour lengths would require policy action at the DoD level. Also, increasing the CONUS force relative to forces deployed overseas would reduce the number of PCS moves generated by overseas replacements, but it would also alter the Army's segment of the national security posture. (Previous research by RAND and others goes into some detail on both the preceding points.)[5]

If people are promoted less frequently and stay in the service longer, they can stay in each position longer; the offsets here are an older force and less promotion opportunity. Finally, an overall reduction in PCS school opportunities would reduce school-generated moves, offset (absent other changes) by a less educated force.

Reducing other soldier absences from units entails reducing individual taskings or time spent in schools. The former is unlikely in today's environment and is in any case irrelevant to DL discussions. The latter is made possible by the judicious substitution of DL seg-

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[4]Based on analysis of FY99 data on course lengths and course attendance from the Army's Training Resource Requirements System. These man-years are not included in TTHS because the student is still assigned to the same unit, and would in fact be available to that unit in the event of a major wartime deployment.

[5]See Hix et al. (1998).

ments for some residential training, as we have mentioned earlier. We note again that measures that improve soldier availability at home station also frequently increase the amount of time a soldier can spend with his or her family. Reducing taskings and unit deployments would also have this effect, but again the policies and procedures that could accomplish this fall outside the scope of a DL discussion.

TURBULENCE AND DL

We turn now to the potential for DL-supported training programs to enhance stability without undesirable policy or structural changes. It is important to note again that the benefits we estimate are robust but certainly not huge, and that reaping these benefits will depend on a careful approach to

- Selection of DL course segments
- Development of courseware
- Allocating resources appropriately to support DL student needs
- Ensuring that soldiers have the requisite time to complete their DL requirements
- Securing support by chain of command and supporting activities.

Experience in DL applications suggests that when the right choices are made about the material to be covered using DL, the same amount of material can be covered in about 30 percent less time (i.e., in about two-thirds of the time required for resident instruction).[6] This is partly because some material can more readily be taught using DL technologies (using a computer is one obvious example). Perhaps just as important, though, are some less technical characteristics of the training or education that are enabled by DL technology.

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[6]Orlansky and String, in their research on computer-based instruction conducted for the Institute for Defense Analyses, found median time savings to be about 30 percent. See Orlansky and String (1979). Orlansky (1983, p. 60) notes in a later article that the principal benefit of computer-based instruction in military training may well be the savings in time, specifically, time saved "in attaining the required minimum levels of knowledge and skills without a loss of student achievement." See also Winkler and Polich (1990).

For example, DL segments can be scheduled at times more optimal for the individual student, making better concentration possible. Self-paced DL, moreover, means the student can concentrate as needed on weak areas and skim or skip areas already mastered—a luxury unavailable in classroom training.

Based on the efficiency factor discussed above, we were able to derive estimates of how much each of a selected set of courses[7] could be shortened if a portion of the course were to be converted to DL. Current TRADOC plans[8] envision converting anywhere from 25 percent to 80 percent of these courses to DL, depending primarily on the nature of the curriculum and its amenability to DL techniques. We applied the 30 percent efficiency factor only to that fraction of the course slated for DL conversion. This results in estimated course length reductions ranging from 7.5 percent (.30 of .25) to 24 percent (.30 of .80).

It is important to note that this estimated reduction refers to the elapsed time for the entire program of instruction, e.g., a ten-week course could be shortened to just over nine or to as little as seven weeks, depending on how much of it is converted to DL. In other words, the new, shorter course length includes the estimated amount of time it will take students to complete the DL portions of the course as well as the resident portions. Note also that the student is at his or her home station for the DL portion of the course, which, as we have noted from the Army's plans, could be anywhere from 25 percent to 80 percent of the previous course duration. We offer again the caveat that not all of the additional time available at home station is time available for unit duties, since a significant fraction of that time will be needed to fulfill DL course requirements. Nevertheless, some additional time, as our measures will show, will also be available as unit duty time.

In short, DL-supported courses increase soldier availability not only by reducing the time spent away from home station, but also by reducing the total amount of time needed for the training. And,

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[7]We used TRADOC's list of courses scheduled for partial conversion to DL. This list is under revision; we expect the next list will be longer.

[8]From the same list. The fractions of courses slated for conversion to DL are also under review.

again, family quality-of-life effects generally follow suit. Reducing the length of time students are in TDY status for residential training will also produce some modest cost savings; the savings potential is less clear when we look at the possibility of converting courses from PCS to TDY.

Chapter Three

A DL EXAMPLE: CAPTAINS CAREER COURSES

The purpose of this analysis was to estimate and compare the potential stability and savings benefits that could result from DL-supported alternatives to current institutional training practices. We were looking for ways to analyze and demonstrate the benefits that could obtain if the Army uses DL to deliver the same professional education more efficiently. We also endeavored to select alternatives that would be consistent with other broad goals, particularly maintaining or improving some aspects of quality of life for soldiers and their families.

PURPOSE AND ANALYTICAL APPROACH

We examined professional development schooling, starting with an in-depth look at the Armor Captains Career Course, and then determined ways to generalize our findings, first to other career courses, and then to other professional development courses for both officers and NCOs. We also made estimates for some Skill Level 1 courses, although the stability effects and savings were considerably more modest. Consistent with our hypotheses regarding DL's potential to reduce time away from home and unit and to reduce some student-related costs, we identified specific measures for these effects and estimated their values as appropriate in each segment of our analysis. We also compared values for these measures across a variety of alternative training patterns.

An example of our approach is our methodology for analyzing the potential effects of different options for converting part of the Active Component (AC) Armor Officer Advanced Course to DL. The ad-

vanced course is the longest component of captains career courses. In all alternatives, we make our estimates assuming that 25 percent of the total course is being offered through DL; this is consistent with current TRADOC plans for officer advanced courses.[1] We also note (as we discuss below) that 44 percent (240 hours) of the Reserve Component (RC) Armor Officer Advanced Course is asynchronous DL. In other words, 44 percent of this course is already being delivered to RC officers without direct instructor contact. Thus, even if we assume that all instructor-delivered training would have to be done as resident instruction for the AC course (i.e., that no training could be delivered by an instructor using synchronous DL), 25 percent DL content should be feasible for the AC course.

We selected a range of options to analyze. Compared with current practice, all options give the officer more time at home station and with his unit. All are consistent with TRADOC's envisioned course conversion projections, as embodied in the list provided to us, and all are consistent as well with basic criteria of feasibility and consistency with personnel policies.

Beyond this, we wanted to develop alternatives that would give our analysis some breadth in terms of different travel patterns and different effects on quality of life. For example, it has been suggested that completing courses like the career course on a temporary duty basis might be better than the current practice of having officers (and their families, if applicable) move to the school installation for the resident course. The idea here is that if DL shortens the course sufficiently, the Army can save one permanent change of station move by having the officer attend the course on TDY. Thus, our alternatives include a mix of PCS and TDY options, enabling comparisons among additional available days, quality-of-life effects, and travel and TDY costs.

For each option we analyzed, we estimated effects on course length, time that would be needed for DL training at home station, days away from unit, days away from home station (not the same thing, as we show), and TDY or PCS costs. We then compared these measures

[1]In our sensitivity analysis we look at the effects of expanding the DL content, although we do not believe an option like this should be pursued until more is known about the effectiveness of DL in imparting the kinds of knowledge and skills found in advanced course programs of instruction.

across options. We also conducted some sensitivity analyses to investigate the influence of our cost factors on the results, and to examine the effects of expanding the DL content of the course.

THE ARMOR CAPTAINS CAREER COURSE

A resident professional development course for new or prospective captains has long been part of the core of the Army's professional development program for its officers. The purpose of the formal education provided at this point in an officer's career is to prepare him or her for company command and junior-level staff work. The current version of this practice is a combination of an officer advanced course of about eighteen weeks' duration, and a six-week session in the Combined Arms and Service Support School (CAS3). The advanced course, whose curriculum is weighted with branch-specific material, is taught at branch schools (e.g., the Armor School at Fort Knox). Officers are assigned to their branch centers as a permanent change of station. CAS3 is a resident course at Fort Leavenworth that brings together officers from all branches and teaches staff planning and coordination for junior staff officers. Students typically attend this course in TDY mode during their tour at one of the branch schools.

The Reserve Component Course as a Model

A primary reason for our looking first at the Armor Officer Advanced Course is that the Armor School is currently running a DL-supported course for Reserve Component (RC) officers. All but two weeks of this course consists of instruction delivered using DL. The course is divided into three phases, listed in Table 3.1.

Table 3.1

Instructional Modes for the RC Armor Officer Advanced Course

Phase	Instructional Mode
Phase I	DL: Web-based, asynchronous
Phase II	DL: Asynchronous and synchronous
Phase III	Resident

The first phase (240 hours) consists entirely of Web-based asynchronous DL. Officers can sign on to the course Web site and work on one or more segments of the material at a pace and a time of their choosing. The second phase has another 60 hours of asynchronous DL and 120 hours of synchronous instruction. The synchronous instruction is provided using DL capabilities, but it includes interaction with an instructor and other students and so must be scheduled for a set time and done at the same pace for all students. The third phase of the course consists of two weeks' resident instruction at Fort Knox, accomplished during the student's two-week Annual Training (AT) period or in some cases during an authorized additional two-week period.

While it is not clear that this course could be an exact model for an Active Component (AC) advanced course, we believe it illustrates the potential for some segment of advanced course instruction to be delivered using DL. In 1999 this course received an award for excellence in distance learning programming from the U.S. Distance Learning Association. The Armor School has asked the Army Research Institute to help evaluate the overall effectiveness of this course; the results of this work should help in the process of deciding how to structure and deliver any AC version.[2]

The Active Component Course

Figure 3.1 displays the current patterns for the AC Armor Captains Career Course and compares the AC officer advanced course with the RC course described above. The Army trains about 220 officers per year in the AC course. The officers move to Fort Knox on a permanent change of station, so officers with families can be accompanied. While at Fort Knox, most (about 75 percent) of these officers also take the Tank Commander's Course or the Cavalry Troop Commander's Course, depending on their prospective command assignment. This

[2]Officials at Fort Knox relate that preliminary results show learning in the asynchronous portions of the course has been good; "students are doubling their learning between pre-tests and post-tests." In addition, students seem pleased with being able to do the Web-based portions of the course from home. Students have generally been able to get assistance, when requested, within 24 hours. Instructors also are generally pleased with student work. Students themselves have rated their learning as effective (most "B", some "A" on an A-to-E scale).

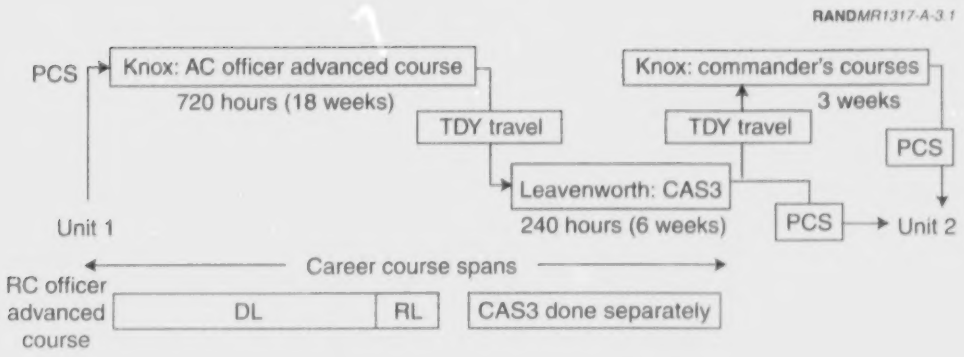

Figure 3.1—Active and Reserve Component Captains Career Courses

course can be taken either before or after CAS3, depending on scheduling. All officers take the CAS3 segment on a TDY basis at Fort Leavenworth. The usual pattern, as shown in the figure, would be for officers to complete the Armor Officer Advanced Course at Fort Knox, and then travel to Fort Leavenworth in TDY status to attend CAS3. Most of the officers would return to Fort Knox for the Tank or Cavalry Troop Commander's Course. Some officers would depart from Fort Leavenworth in PCS status en route to their new units, and return to Fort Knox later to complete the tank or troop commander's course.

Thus, even the current pattern for the Armor Captains Career Course involves some TDY (and, accordingly, some limited amount of family separation). Moreover, it is important to note that with current practice, most officers attend the commander's courses while stationed at Fort Knox for the advanced course, so no TDY is involved for the commander's courses. But if the advanced course were to be converted to TDY, these courses would also be TDY and would add to the overall TDY cost.

Alternatives

As mentioned above, all alternatives involve reducing the resident portion and the overall length of the Armor Officer Advanced Course. Using the factors described earlier, we estimated the effect of converting 25 percent of the 720-hour resident course to a DL module and shortening that module by 30 percent to account for the effi-

ciency of the DL segment ($720 \times .25 = 180$; $180 \times .70 = 126$ hours). Thus, each alternative includes an advanced course that requires 94 resident days,[3] compared with the current 126 days (18 weeks), and a DL module that requires 126 hours (about 16 eight-hour days) of study at home station. We also looked at possibilities for changing the course from PCS to TDY mode, as well as the effects of simply shortening the course. All alternatives involve at least one PCS, as the career course sequence comes between PCS assignments. That is, even if the officer does the entire sequence in TDY mode, one PCS still takes place, with attendant costs. The difference is that with PCS courses, there are two PCS moves instead of one.

The four alternatives we considered are as follows:

Case 1. All resident requirements completed in TDY status

Case 2. Resident requirements done as three separate TDYs

Case 3. Mix of PCS and TDY-and-return, as determined based on Army requirements and officer preferences

Case 4. Current PCS pattern with career course segment shortened by including a DL module.

The Case 1 alternative was motivated simply by our intent to start with a comparison of TDY versus PCS, assuming that the DL-induced shortening of the advanced course could make a conversion to TDY feasible. In this alternative, all the courses in the sequence would be completed in a single (and lengthy) TDY.[4] This case imposes significant family separation, a major disadvantage when taking into account soldier well being and quality-of-life considerations. Thus, the Case 2 alternative allows for return home between the different segments. This reduces the family separation impact somewhat by breaking up the separations, but it increases travel costs. The Case 3 alternative allows some additional flexibility between PCS or TDY, allowing the Army to help officers avoid family separations but also

[3]720 – 180 = 540 hours, or 67.5 eight-hour days. This is 13.5 five-day work weeks. 13.5 seven-day weeks comprise 94.5 days.

[4]Note from our earlier discussion that the Army's career courses include CAS3, and that most Armor Captains Career Course students also complete a tank commander's or troop commander's course while at Fort Knox.

offering others the possibility to avoid family disruptions by taking the course TDY and moving their families once instead of twice. Case 4 avoids altogether the family separation effects by simply leaving the current PCS pattern in effect and shortening the advanced course. This change would be the easiest to make administratively.

We look at the stability enhancement effects of these alternatives and then at some PCS and TDY cost implications. As might be expected, the key factors influencing the changes in available days are total course length, fraction of course converted to DL, and the length of the DL module. We also made allowances for other activities that would consume the time of our student officers, including travel and processing time. For each option we estimated the additional days that each officer would be at home station and available for unit duties.

As we mentioned briefly before, "available at home station" and "available to the unit" are not the same thing, since the officer must devote some time at home station to studying the DL course materials. We therefore identified three different measures that capture the overall effects on officer availability. The first is total additional time on home station (in most cases we presume this would be the losing station). For example, we estimate that our first alternative increases the total time a captain can be at home station by 43 days.[5]

This first measure is also relevant to soldier well being and family quality-of-life considerations, since reductions in TDY absences reduce time absent from home station and thus from family and friends. This measure shows unambiguous benefits in those cases (discussed in subsequent parts of this report) where the courses are already TDY and thus add to family separations. Unfortunately, it is somewhat misleading in cases where an alternative could increase family separations, like some of the advanced course options we discuss here. For example, the alternative cited above, which leaves the officer at home station for 43 additional days, actually *increases* family separation (by a not inconsiderable four-plus months) because it

[5]This includes 32 days (25 percent of 126 days) from shortening the resident course, and 11 days resulting from reduced PCS processing and travel time, since there is only one PCS. Figures for other alternatives were derived similarly.

changes the course from an accompanied PCS to an unaccompanied TDY. Since soldier well being and family quality-of-life considerations are important to the Army, we include observations on these effects and treat the degree of family separations as an additional indicator of value.

The second measure of soldier availability is additional home station time adjusted to reflect the time that should be consumed by DL course work. Measured as the raw difference between the additional days at home station and the days needed for DL study, it could be considered an upper limit to the time a student could be made available to his or her unit. Continuing with the example above, this measure tells us the officer would be available for about 27 additional days after allowing for course work.[6]

The third measure is an estimate of minimum additional time available for unit duties. It is based on the following assumptions:

- The student would complete all DL work in eight-hour days,
- He or she would be given the required number of duty days (in the case at hand, 16) to accomplish the study, and
- He or she would be unavailable for any other purpose on any of those days.

In our example, this measure comes to 15 days.[7]

The last two measures, particularly the third, are in our view conservative: they understate the potential effects of additional officer availability, especially if DL study time is scheduled judiciously. For example, the officer can be available for at least some part of every day, e.g., to attend physical training with the unit, to meet with others for counseling or planning sessions, to participate in ceremonies, and the like. Similarly, the officer could be available for longer periods on some days and could also, assuming some careful

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[6]43 days less the 16 days needed for DL work yields 27 days. This 16 days (actually 15.75) is 30 percent less than the 22.5 residential days the DL segment replaces.

[7]The 43 additional days span 6 weekends. There are thus 31 ($43 - 2 \times 6$) additional duty days available. Using 16 of these days for DL course work leaves 15 available to the unit. As we shall note shortly, this is clearly a conservative measure.

advance scheduling, attend field training. This would entail allowing for some DL study time starting as much as two or three months before the officer's departure for the resident course. As many have pointed out to us in our interviews, such flexible scheduling will require something of a "culture change" regarding officer training time and availability. Absent such a culture change, results will more likely be near the minimum measures. Also, the Army is just beginning to staff and implement policies designed to ensure that soldiers receive the requisite time to complete their DL work. Until the effects of these policies have been evaluated, we believe it is prudent to use minimum measures, noting that careful scheduling and use of time will improve soldier availability more than these measures suggest.

A reasonable point of comparison for the increases in available days in our advanced course analyses is the average number of days an Army captain is currently assigned to his or her first post. In most cases, this is the post from which the officer will depart to attend the career course. Figure 2.1 shows that this average for all Army officers has been about 29 months. For junior officers at the point where they would be going to an advanced course, the comparable average has been similar: just over 30 months, or about 915 days. Thus, a one-month increase in time available at home station would be about a 3 percent increase in total time on station for the affected officer. Work-day comparisons would be similar: 915 total available days equate to about 600 working days, after allowing for weekends, holidays, and leave, i.e., a work-year of about 240 days.[8] So a 15-day increase in available work-days is about a 2.5 percent increase.

Another possible comparison is with the total number of student man-years in the TTHS account. This account measures what is in essence an "overhead" count of soldiers who, because they are in one of these categories, are not available to the Army's functional

[8]This again opens the question of weekend work; treatment of this would in our view needlessly complicate the analysis. Certainly officers work on weekends periodically, particularly when field exercises span more than a week. For comparison purposes in this analysis, we would offer that weekend work schedules would apply equally to officers undertaking DL studies. An arrangement whereby an officer does DL work on a weekend when his unit is in the field is one possibility. Another is that the officer attends the field duty, which means he or she is now available more than our estimate of minimum days.

units or organizations. The TTHS account typically reflects around 65,000 man-years in these four categories, of which about 12,700 are student man-years, including about 6,200 officer student man-years.[9]

RESULTS OF CASE ANALYSIS

Case 1: TDY Only

Converting the advanced course segment of the Armor Career Course sequence from PCS to TDY is the simplest conversion option. In this option, officers would attend all courses on a TDY basis: the advanced course at Fort Knox, CAS3 at Fort Leavenworth, and the appropriate commander's course (tank commander or troop commander) at Fort Knox. This adds, in effect, two TDY segments (advanced course and commander's course) and removes one PCS move. As Figure 3.2 indicates, this option results in upwards of 40 days more time available at home station for each officer. This includes the days saved by shortening the resident portion of the course and some additional days saved in PCS processing since only one PCS occurs in this alternative. After allowing for DL study time, this option yields between 15 and 27 additional days available to the unit, depending on how duty time is apportioned and scheduled. However, this is the least favorable option from the standpoint of family well being for those officers with spouses and families, since it entails a long period of separation—upwards of four months longer than with PCS options—during the TDY courses.

Case 2: Separate TDYs for Each Training Event

This option is essentially the same as the first except that it allows for breaks in the extended TDY period: officers can return home between courses, so the major unfavorable family impact of the first case would be alleviated somewhat. But the additional family separation time would remain at more than four months; the family impact of both these options is a significant disadvantage. This draw-

[9]DCSPER 170 Report through May 2000. In the most recent 12 months through May 2000, the overall TTHS account fluctuated from 57,000 to just fewer than 73,000; the average was about 65,000.

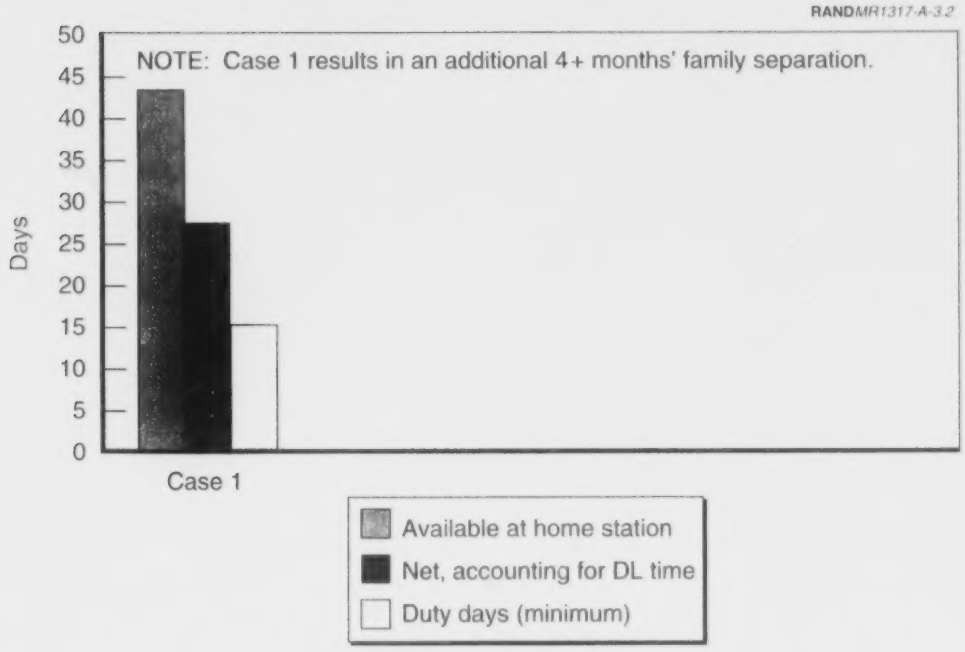

Figure 3.2—Increase in Available Days (Case 1)

back, coupled with the added travel costs (discussed below) and time associated with multiple TDY trips, makes this the least desirable option. Figure 3.3 compares Cases 1 and 2.

Case 3: TDY or PCS; Officer's Choice

In this alternative, we considered the possibility of reducing the family impact still further by allowing for personnel managers to use a mix of PCS and TDY options, attempting to accommodate officer preferences (which could go either way) within Army requirements and available resources. While we believe most officers would prefer to be accompanied rather than have long separations, some might prefer not to take their families through an additional move. It might even be possible in some cases to move families to the gaining installation. This would matter, for example, to officers with school-age children, although this is a relatively small segment of the career-course population. It would also matter in cases where employment

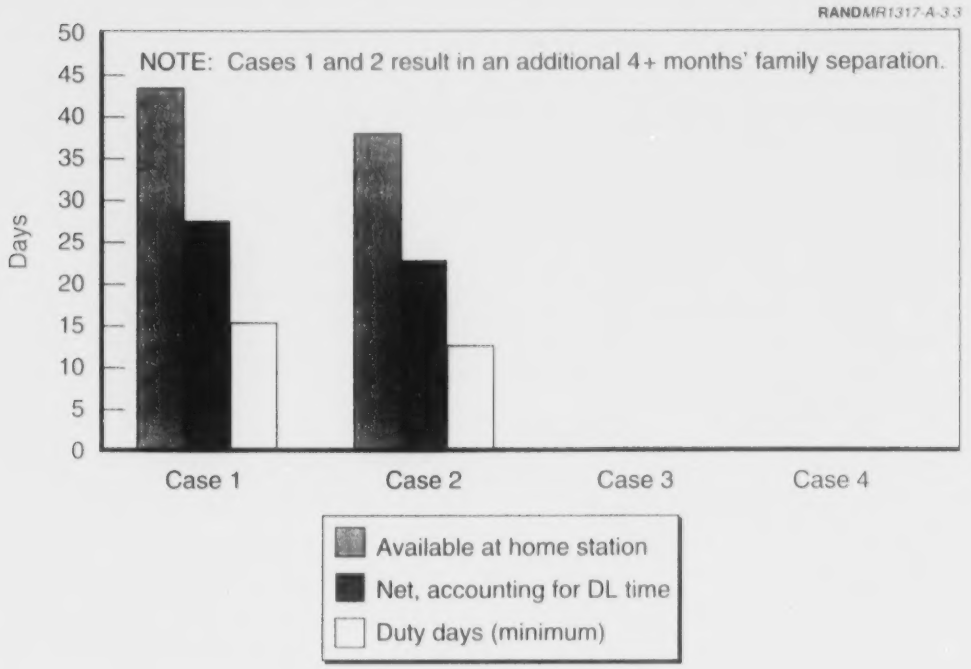

Figure 3.3—Increase in Available Days (Case 2)

considerations for the spouse make TDY a better option for the student.

Although it does not provide as much in the way of stability enhancement as the first two alternatives, this alternative or the next one (PCS advanced course, but shorter) is probably the most desirable because it eliminates the disadvantages of long family separations. Figure 3.4 provides a comparison.

Case 4: PCS, but Shortened Course

This alternative, like the first, has the advantage of simplicity: it retains the same pattern as the current practice, but shortens the resident advanced course phase, as in the other alternatives, by substituting a DL module for one-fourth of the course requirement. It is thus the easiest change to make. It does not allow for any officers to

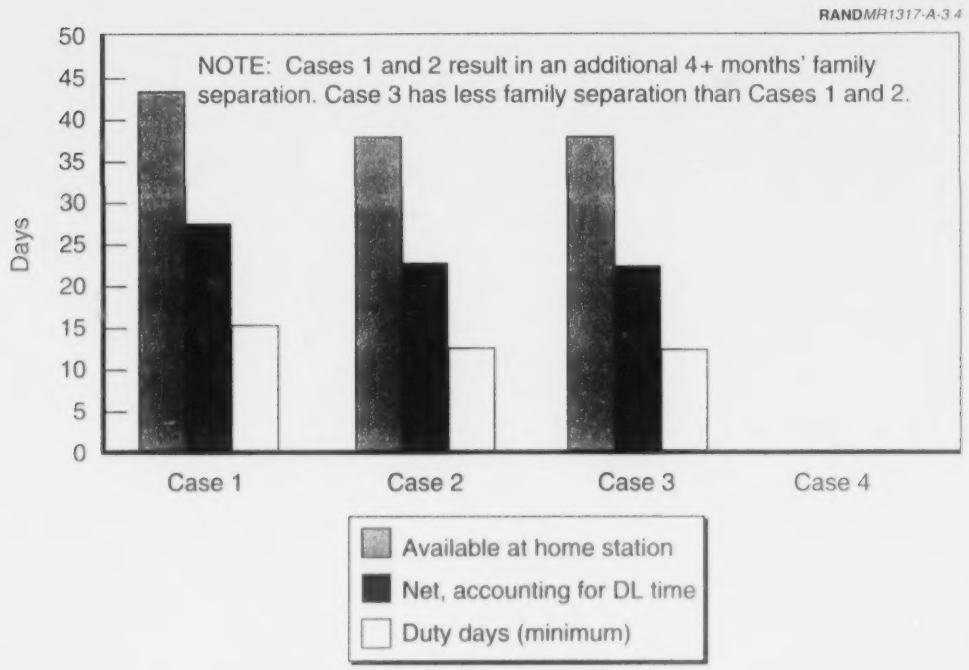

Figure 3.4—Increase in Available Days (Case 3)

avoid a move for their spouses and families—but it is no worse than the current practice in that respect. Because there are two PCS moves in this alternative for all officers (except the small number who either are at Fort Knox already or are assigned to Fort Knox after the course), more days are lost to processing and travel, but again no more than in the base case (current practice). Figure 3.5 compares the alternatives.

As we will show in our subsequent discussion, all alternatives have essentially the same cost; if anything, the alternatives that expand the use of TDY travel and its attendant expenses are somewhat more expensive than those that include the current PCS pattern. Furthermore, when we account for family separation considerations, this alternative or the previous one appears to be the best choice: both either reduce or eliminate disadvantageous impacts on families, and still provide significant stability enhancement by making officers available to their units for a longer time.

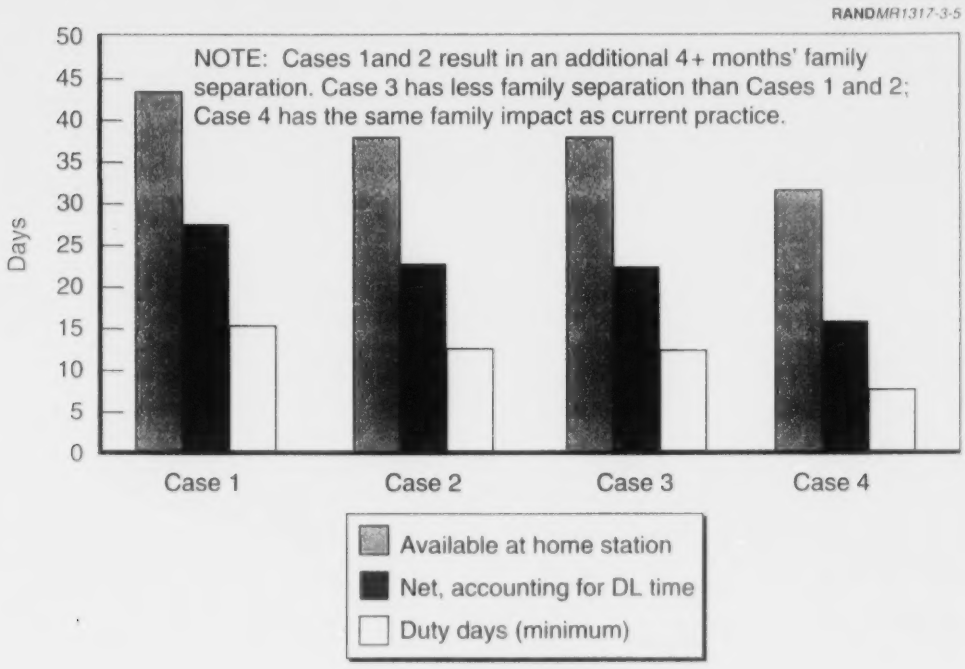

Figure 3.5—Increase in Available Days (Case 4)

AVAILABLE DAYS SENSITIVE TO DEGREE OF DL CONVERSION

As part of our sensitivity analysis, we analyzed several options regarding the size of the DL module and thus, as a derivative, the length of the residential portion and duration of the overall course. Not surprisingly, there is an essentially linear relationship between the number of days an officer is available (by all three measures) and the size of the DL module: the more a course can be converted to DL, the more the student can be available at home station. Figure 3.6 illustrates this.

The first set of bars on the left shows increases in available days derived from our second alternative, which is representative of the four options we examined. Recall that this alternative and its companions start with a 25 percent conversion of the advanced course curriculum to DL, which reduces the resident phase from 18 to a little more than 13 weeks. This particular case gives each officer 38 addi-

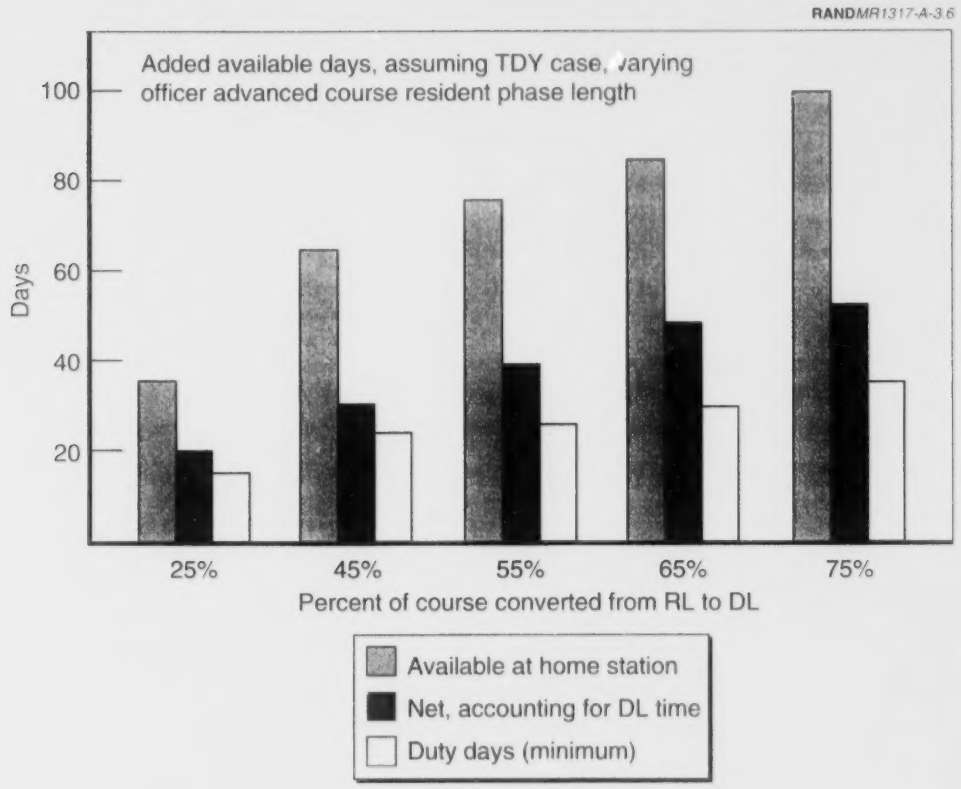

Figure 3.6—Relationship Between DL Component and Available Days

tional days at home station compared with the present system, which means an upper estimate of 22 days and a minimum of 12 days available to the unit. The other alternatives yield similar results, although those with PCS processing result in somewhat fewer available days, as shown previously.

By comparison, a 45 percent conversion to DL yields a larger number of available days: 61 at home station, 33 after accounting for DL study time, and a 17-day minimum estimate of available work-days. These and the previous figures should be compared for perspective with our previously derived 915 days (average on station for junior captains) and 600 days (average work-days).

The rest of the diagram simply emphasizes the magnitude and monotonic nature of this relationship. It also suggests that more DL

conversion is better. This of course is not true: the limit to conversion will come from deciding how much can effectively be converted to DL out of a curriculum that includes tactics, leadership, planning and decision-support processes, unit administration, criminal justice proceedings, and a host of other potentially complex topics. This is an area that the Army is already exploring more extensively; our analyses illustrate the potential benefits of further conversions to DL if they can be supported from the standpoint of training effectiveness. The excursions shown in this diagram all have more severe reductions in resident training time than the alternatives we discussed in the previous charts, making them less desirable from a training effectiveness standpoint unless it can be demonstrated that additional course material can be taught effectively using DL.

Assumptions about travel and processing time have some impact, but they depend only upon the choice of option (PCS versus TDY). Within a reasonable range of assumptions about processing and travel time, the impact is small and is in any case of marginal relevance to DL initiatives.

ESTIMATING COSTS AND SAVINGS

We turn next to a discussion of costs and savings. First, we offer a quick overview of the Army's investment in distance learning. This investment amounts to about $630 million, covering infrastructure, expenses involved in developing courseware, fielding costs, and the management costs tied to program development and implementation. These costs have been estimated through the year 2015, but most ($440 million) are in the early and middle stages of that period. A little over $110 million was spent in 1998 and 1999; the figure for 2000 through 2007 is about $330 million. These can reasonably be considered start-up costs of the program. Additional investment costs anticipated in the later years primarily involve continuation of courseware development and future software and hardware upgrades, along with some minor residual fielding and procurement costs.[10]

[10]The source for these figures is TADLP's Economic Analysis. The Army National Guard's Distributed Training Program had about $220 million in costs through FY00 that are not included in these figures. The Army also has other programs, currently

The DL program—like the residential learning programs it will partially replace—will also have recurring (operating) costs in the areas of course maintenance (i.e., keeping course materials up to date), facilities maintenance, instructors, and support personnel. There is significant evidence to the effect that DL can be more cost-efficient than residential learning,[11] but we urge caution in anticipating structural savings until more is known about DL's implications for school support and instructional resources.

Development of the appropriate mix of instructors and support personnel to carry out resident and distance learning programs will be a complex process. Both will still be needed, albeit in somewhat reduced numbers, for the residential segments that remain in each course. Moreover, some instructors and support personnel will be needed in DL segments to conduct synchronous training as needed, to monitor student progress, provide feedback, and attend to quality assurance. Resource managers will have to remember that these and similar functions must be performed for both the residential and distance learning portions of each course, and thus that the schools and centers will need to be staffed with both requirements in mind. Also, as school officials around the Army frequently reminded us, instructors (and to a lesser extent support personnel) perform duties other than platform instruction. Most are also committed to part-time support of doctrine and training development, including development of training materials for units and organizations in the field, and all have part-time administrative duties.

Thus, while one might expect TADLP to lead to some savings in the operation and support of the Army's schools, we believe it would be premature to count on these forms of savings. The Army should closely monitor the realization of savings and cost avoidances and compare them with the estimates in TADLP's Economic Analysis, adjusting program implementation as necessary to capture the best payoffs.

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outside the purview of TADLP, that are using or will be able to capitalize on DL technologies. These include computer-based training, DL support for the Army's Continuing Education Program, and Army University Access Online, the new initiative to provide greater access to college courses.

[11]See, for example, Rumble (1997), especially Chapters 13 and 17.

PCS and TDY Costs

We focus here on savings that can reasonably be estimated based on planned DL conversions and their effects on time spent and travel involved in institutional training. Even in these areas, as we will show, the estimates are by no means concrete. Key elements in our estimates include factors for PCS costs, TDY travel, lodging, and per diem. The other determinants are the number of PCS moves (for courses that involve PCS moves, like the advanced courses), and the duration of TDY periods.

This analysis examined cost factors related to three elements of cost in the captains career course: PCS costs, TDY travel (airfare) costs, and TDY per diem (daily lodging and food) costs. These three elements show up from top to bottom as the three segments of the bars in Figure 3.7. Although data on actual PCS costs experienced by the students of the Armor Captains Career Course were not available, these costs can be approximated using average figures for officer PCS costs, accounting for three different types of PCS moves. The costs per person in FY00 were $14,100 per rotational move, $9,100 per operational move, and $6,600 per training move.[12] TDY travel costs, including the airfares between posts, were obtained from the Carlson-Wagonlit travel agency. TDY per diem rates for Leavenworth and Knox were estimated at $60 per day; consistent with rates for CAS3 and lodging/per diem costs at Fort Knox. Using these figures and move patterns for career course students derived from the Officer Master File, we estimated the cost of our various TDY and PCS alternatives. It is important to note again that all alternatives include some PCS and some TDY; it is the relative mix of these modes that matters. For example, our Case 1 ("All Courses TDY") still includes a PCS move from the previous unit of assignment to a new unit; this move could come either before or after attendance at the various courses.

[12]Training moves are from a CONUS station to a school. Operational moves are from one station to another in the same major geographical area (i.e., not overseas). Rotational moves are overseas, to or from. A move from overseas to a school counts as a rotational move, not a training move. Also, we counted moves *from* school as operational moves, which further biases the analysis toward higher PCS costs. Our sensitivity analyses address variations of these factors.

We found that, within a reasonable range of values for the various PCS and TDY cost elements, the costs of our alternatives are roughly comparable, as shown in Figure 3.7. Note that all cases (1, 2, and 3) where we model expanded use of TDY show increases in TDY costs that more than offset reductions in PCS costs. Note also the further increase in the TDY travel component (middle band in the bar charts) in Case 2, reflecting the additional travel associated with multiple TDYs. PCS and TDY costs for the current practice and our Case 4 are the same: the only difference between these two alternatives is the length of the advanced course component, which is done as a PCS and thus has no bearing on TDY costs in this alternative. Thus, unless TDY costs can be substantially reduced, or unless we are very low on the estimate of PCS costs (unlikely, as we shall discuss), then the PCS options (current practice and Cases 3 and 4) are more favorable from a cost standpoint. We will discuss this finding in more detail in connection with sensitivity analysis in the next few paragraphs.

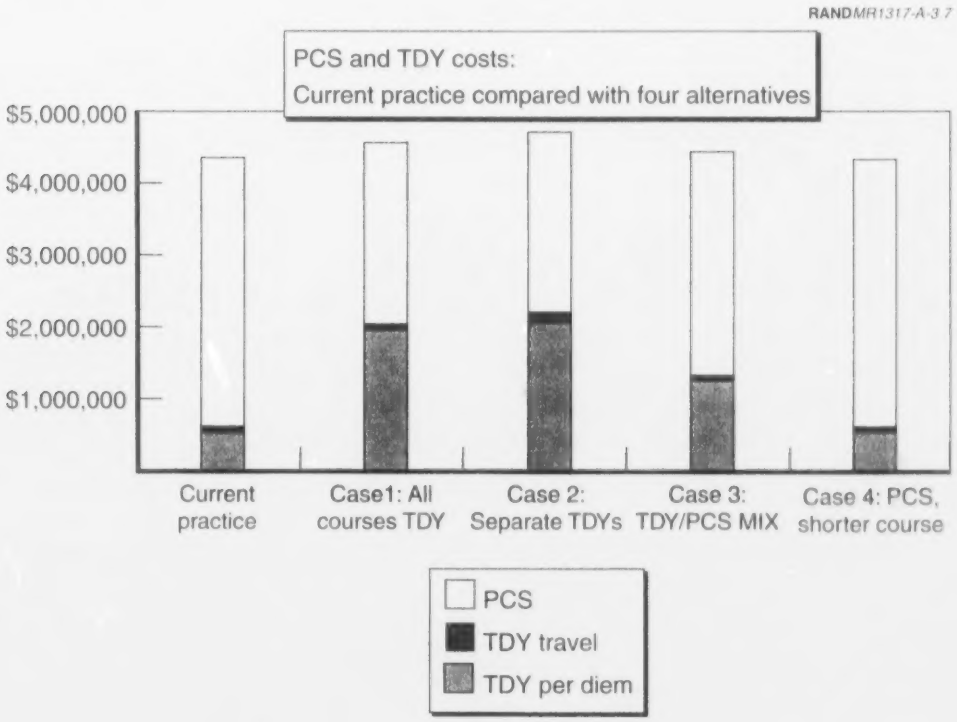

Figure 3.7—Cost Comparison of Cases

Sensitivity of Results to Cost Factors and Course Length

The analysis underlying Figure 3.7 relies on some important assumptions about the costs associated with TDY travel and lodging, and costs of PCS moves, the length of processing and travel, and the length of the advanced course (Fort Knox) segment of the captains career course. As we pointed out above, the PCS savings from converting to TDY are generally offset by increases in TDY costs. This, again, is consistent with previous research in this area.[13] Moreover, we have good reason to believe that the PCS cost factors being used here are at the high end of a reasonable range, since they are a composite of the costs for all officer moves. The Army does not have detailed breakouts of PCS costs for subcategories such as seniority or number of dependents. Available data showed only the cost for each general type of move (e.g., rotational, operational, training, etc.). In other words, the junior captains (and senior first lieutenants) in our analyses here are assigned the same PCS cost factor as more senior officers, who would tend on average to have more dependents and more personal property to ship. Thus, if anything, the average cost factors we were provided are high for the population we are considering.

Reasoning, accordingly, that our PCS cost factors are upper bounds, we confined our sensitivity analyses to the results that would obtain if we use lower PCS cost factors. For example, we note that the planning factors show the average cost for a training move ($6,600) to be much lower than the $9,100 for an operational move. We suspect this is because officer training moves are more heavily weighted with junior officers (i.e., primarily the three to four thousand captains who go to the career course every year) than are the operational moves (which would more closely be a composite of all officers). Thus, it might be reasonable to assume that actual operational move costs for our selected sample of captains would be closer to the training move average than to the operational move average. Similarly, we reduce rotational move costs in our sensitivity excursions, reasoning as above that our population is going to have fewer dependents and less baggage than the average for the overall population that forms the basis for the factors.

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[13]See Hix et al. (1998), pp. 16–17.

Our intent in the sensitivity analyses is to illustrate the ways in which PCS costs, TDY costs, and course lengths influence our cost estimates, and thus examine the ways in which changes in these factors could affect the relative merit of the alternatives we examined. Simply put, higher PCS costs naturally favor options with more TDY, like our Cases 1 and 2. Likewise, lower TDY costs and shorter resident courses (bigger DL component) would favor TDY options.

Carrying this basic logic a bit further, Figure 3.8 illustrates a view of the tradeoff between PCS and TDY alternatives. The solid diagonal line in this figure represents a set of points (combinations of PCS cost factors and resident course length) where the cost of a TDY alternative matches the cost of a PCS alternative, i.e., points at which we would be indifferent, from a cost standpoint, between PCS or TDY. We use here our Case 1 as the TDY alternative, and Case 4 as the PCS alternative. Points above this line, like point A, represent assumed higher PCS costs, shorter resident course length, or both. In this area, the balance tips in favor of the TDY option, at least from a cost standpoint. Below the line (point B is an example) lie lower assumed PCS costs and longer residential times, which favor the PCS option.

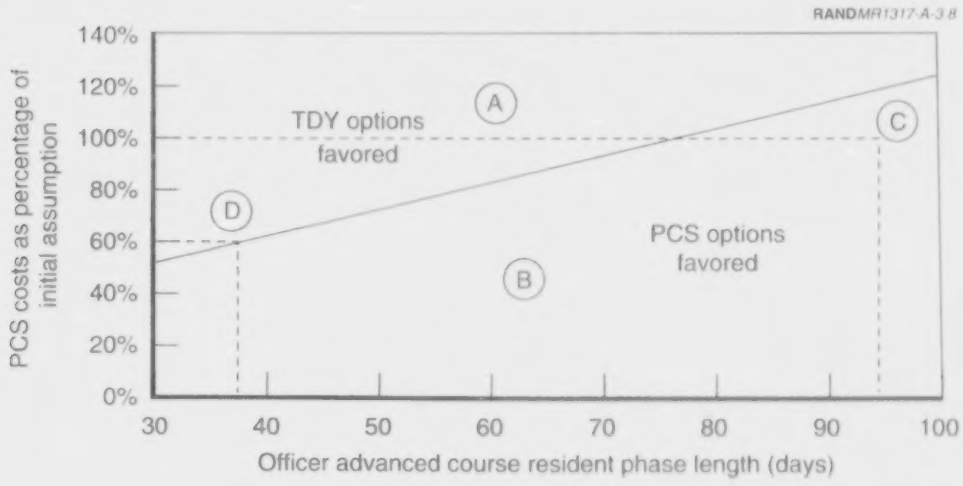

Figure 3.8—Sensitivity to Course Length and PCS Costs

The dotted vertical line at 94 days represents the duration of the residential portion of the Armor Officer Advanced Course in our alternatives. With this resident time and assuming our PCS cost estimates are accurate, the PCS option is slightly favored (i.e., point C falls just below the line). This is consistent with our finding that the estimated costs of all our alternatives are similar, provided one assumes that our PCS cost factors are accurate. Relaxing that assumption and allowing for the possibility of lower PCS costs, as we believe would be reasonable, tips the balance further in favor of the PCS option. Note that if PCS costs are 60 percent of our original estimate, residential time would have to be cut to about 38 days or less for the TDY option to cost less: point D. This would be more than a two-thirds reduction in residential learning time, which we do not believe would be desirable.

Figure 3.9 presents similar logic in a different fashion. Here, we look at the possible effects of making TDY options less expensive by reducing per diem rates, assuming for the moment that consolidation of lodging arrangements or making lower-cost government meals available would be feasible. This would of course make TDY options more attractive, at least from a cost standpoint. The downward-sloping solid curve in this figure represents points where the TDY alternative costs the same as the PCS alternative, assuming PCS costs are equal to our original estimate. Here, points above or to

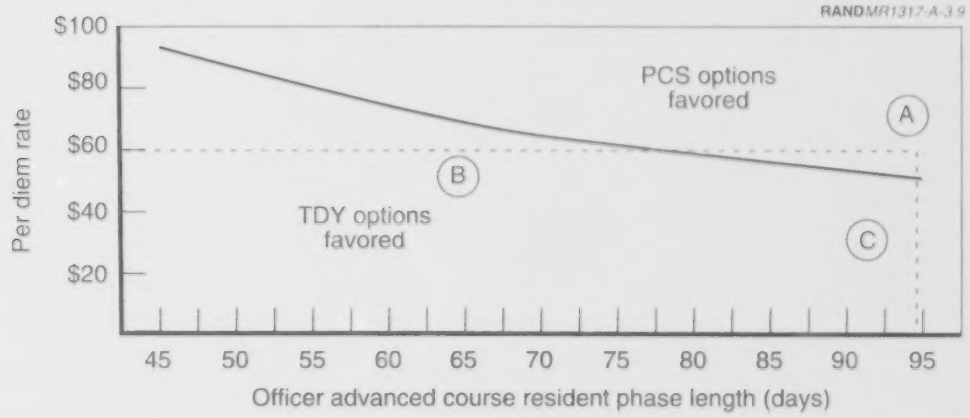

Figure 3.9—Sensitivity to Course Length and TDY Costs, Assuming High PCS Cost Factors

the right of the curve represent higher TDY cost factors or longer resident phases, so this area (containing point A) favors PCS alternatives. Note that with the original PCS cost factors and the 94-day resident course, the PCS option is again favored (point A is above the curve). Reducing the resident phase (moving to point B, for example) or reducing per diem costs (moving to point C), if such changes were feasible, would make the TDY options more attractive.

Figure 3.10 recalls our earlier argument that our original PCS cost factors are most likely on the high side. The downward-sloping curve in this figure is analogous to the one in Figure 3.9, but it represents an assumption that PCS cost factors are 60 percent of our original ones. It is also important to see that anywhere in this figure, a combination of much lower per diem rates and a much shorter resident course would be needed to push the cost of the TDY option below the cost of the PCS option. Point A is illustrative.

In short, both these graphical illustrations tell us that within a reasonable range of the relevant cost factors (i.e., absent unreasonable manipulations of those factors), the PCS options we explored cost at worst about the same as the options with more TDY, and more likely less. Figure 3.11 compares the TDY and PCS costs of the base case and our alternatives, showing costs based on 100 percent PCS cost

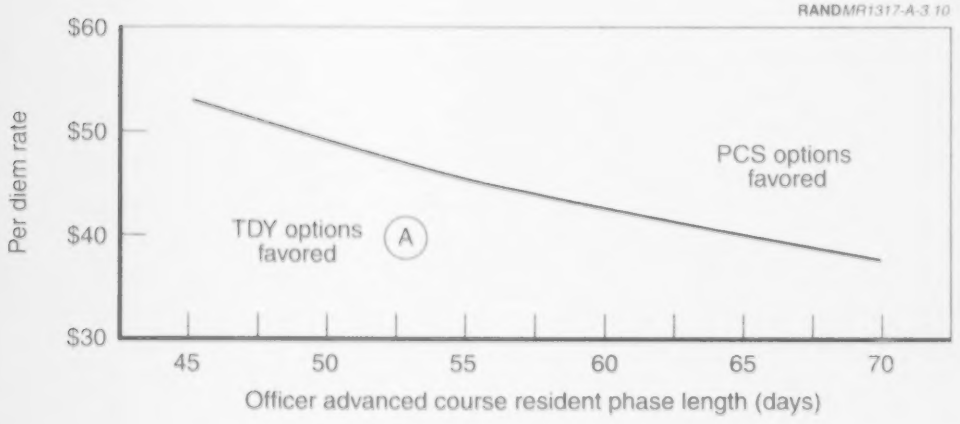

Figure 3.10—Sensitivity to Course Length and TDY Costs, Assuming Lower PCS Cost Factors

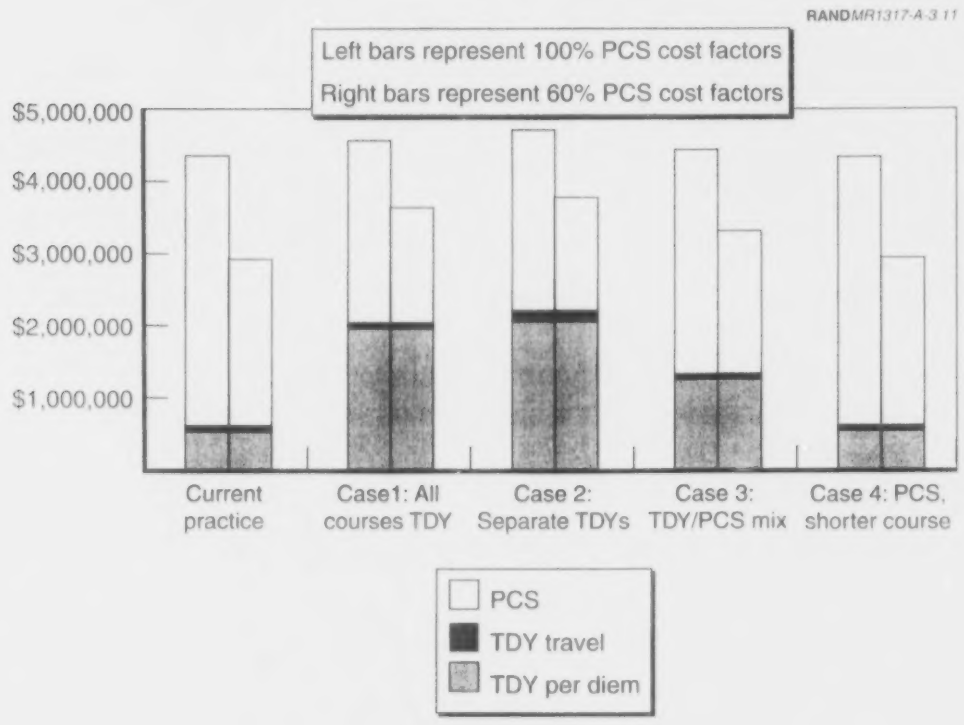

Figure 3.11—PCS and TDY Costs, With 100 Percent and 60 Percent PCS Cost Factors

factors (recalling Figure 3.7) and costs with the 60 percent PCS cost factors we dealt with in the sensitivity analysis. In these bar graphs, the only things that change are the PCS cost components (top segments); note that the use of 60 percent cost factors somewhat widens the differences between the PCS-heavy and the TDY-heavy options.

CAREER COURSES IN GENERAL

We now turn to the possibility of extending our logic to other career courses. We use here our figures for the fourth alternative, and apply the estimated per-officer increases in available days to a career course–bound population of some 3,500 to 4,000 captains per year.[14] We employed the basic methodology used with the Armor Captains

[14]The FY99 ACC promotion list had 4,100 names on it; FY98 had 3,500.

Career Course: 25 percent conversion to DL, with the DL portion 30 percent shorter than the resident portion it replaces. We also assumed the PCS option would be retained. Based on these figures and assumptions, we developed an estimate of about 300 to 340 additional man-years (using the total-time-on-station measure), or between 115 and 135 working man-years (using our minimum measure of duty days, converted to working years). Consistent with our previous reasoning, these effects can be larger than our conservative measures indicate, depending on how carefully officers and their supervisors can schedule DL preparation and study time around unit duties. Also, the effect on stability enhancement is greater if TDY options are chosen (less time used in PCS processing), but the negative effect on families is significant. Overall costs for student travel will also rise in the TDY alternatives, as we have shown earlier.

For comparison, recall from the treatment of our measures of available days[15] that overall officer student time imposes a TTHS load of about 6,200 man-years. The relevant comparison is with on-station available man-years (300 to 340 by our estimate), so the DL options for advanced courses could reduce "actionable" student man-years by about 5 percent. Another relevant comparison, since we are dealing here with the career course student load, is with an estimate of officer days consumed by career courses. The Army does not track this statistic separately, but it is reasonable to posit that these courses currently consume about five to six months per officer, so a figure of 4,000 officers per year yields a man-year load of about 2,000. Therefore, the DL conversions could save some 15 to 17 percent of this measure of "actionable" man-years. At a time when the Army is experiencing a shortage of some 2,700[16] captain man-years, this is a significant benefit. We will come back to this form of comparison later in the report when we discuss the extension of our logic to a broader set of courses.

Thus, we recommend that the Army continue to pursue the options it is examining for bringing DL modules into its officer advanced courses and reducing the overall duration of these courses. In par-

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[15]See Chapter Two, and in particular Figure 2.1 and the discussion that follows.

[16]2,746, according to the DCSPER's Military Manpower Program Review for August 2000.

ticular, it should be possible to capitalize on courseware already developed to expand coverage. It should also be possible to develop a more precise estimate of actual benefits, costs, and savings. Absent major reductions in course lengths, which we do not believe would be prudent at this stage, we also recommend that the Army retain the PCS variant of these courses. If avoiding family moves is enough of a concern for some officers, the Army could experiment with a pilot program along the lines of our third alternative, where personnel managers can employ a mix of TDY and PCS, but this will raise costs slightly for officers attending in a TDY mode.

Chapter Four

EXTENDING THE ANALYSIS TO TDY COURSES

So far the analysis has focused only on courses now being done in PCS mode, and it found that partial DL conversions of these courses enhances stability by keeping soldiers in their units longer at about the same costs (PCS or TDY) now being incurred. See Figure 3.7. These same broad findings would hold for other PCS courses as well, and our recommendation would be the same: absent a major reduction in overall course length, retain the PCS option; convert some of the residential portion of the course to DL; monitor the costs of conversion and the effectiveness of the training.

TRADOC is currently engaged in just this sort of analysis: looking at partial DL conversion options for more than 500 courses, including the officer advanced courses we have just discussed, a few other PCS courses, and a wide range of courses already being conducted in TDY mode. We present here some observations on a subset of the TDY courses.

First, with regard to stability enhancement, the effects for TDY courses are less ambiguous than those we find when dealing with PCS courses. Recall that students at PCS courses have their families with them, so changing the length of these courses affects family time only if the change also includes a conversion to TDY, in which case the effect on the family is negative.[1] This problem is resolved when we consider courses that are already TDY: units and families both benefit from the additional available time at home station that

[1]As we pointed out earlier, this is a significant reason for not recommending conversion of PCS courses to TDY.

results from DL conversion. Analyses of TDY costs are likewise unambiguous for these courses: every additional day at home station is an additional day of TDY costs saved.

With these overall considerations in mind, we applied the same cost and benefit indicators used earlier in analyzing options for the Armor Captains Career Course: increases in time available at home station and available to unit, and savings in lodging and per diem costs.

METHODOLOGY AND DATA SOURCES FOR ANALYSIS OF TDY COURSES

Our methodology for analyzing the TDY courses was analogous to our approach for the advanced courses discussed previously. We used TRADOC's DL conversion listing to divide the courses into DL and RL segments and then calculated a new course length based on this division and the previously discussed 30 percent efficiency factor for the DL segment. The additional days made available derive from the lengths of these two segments. Total additional days available at home station are the old course length (all residential) minus the length of the new residential segment. Net days available are this total minus the number of days needed to accomplish the DL segment. Finally, as before, we calculated a minimum value for additional days using strict assumptions, repeated here for convenience:

- the student would complete all DL work in eight-hour days,
- he or she would be given the requisite number of duty days to accomplish the study, and
- he or she would be unavailable for any other purpose on any of those days.

Savings calculations for TDY courses are simpler than those presented earlier. In these cases, the savings are simply the number of days the TDY is reduced (i.e., the number of additional days at home station) times the TDY cost factor times the annual student load for each course. For professional development courses, we used a con-

servative TDY cost factor of $30 per day,[2] including both lodging and per diem. For Skill Level 1 courses, we used $10 per day, assuming these soldiers would live in barracks.[3] With one exception we will note later, transportation costs are unchanged since the students still attend a residential segment away from home.

We used TRADOC's list of courses being considered for partial DL conversion as a starting point for our analysis. This list is currently being revised, with more courses being added and some of the DL:RL proportions being revised, but the results of these revisions are not yet available.

We excluded courses not listed in the Army Training Requirements and Resources System (ATRRS) and courses for which ATRRS or other data were not posted. We also considered separately courses of short duration (two weeks or less) because they raise questions about the cost-effectiveness of continuing the resident TDY phase. We also separately considered courses offered at Skill Level 1.

APPLYING THE METHODOLOGY TO OTHER TDY COURSES

Basic Noncommissioned Officer Course for Artillery and Signal NCOs

Table 4.1 illustrates the application and results of the methodology just described to an artillery (MOS 13B) and a signal (MOS 31U) Basic NCO Course (BNCOC). We first applied the DL conversion factor implicit in the list provided by TRADOC to calculate the new residential course length, and we used the 30 percent efficiency factor to estimate duration of the DL segment. For example, the 13B BNCOC requires 43 residential days, including weekends. The DL conversion factor for this course is 60 percent, so the course would break into a residential module of about 99 hours and a DL module of about 104 hours. Total residential time required, including weekends, to complete the residential portion, would be about 17 days. The 104 DL

[2]This can be either higher (in some cases as high as $85 or more) or lower, depending on availability of lodging and meals. Our sampling of rates from TRADOC installations satisfies us that $30 is a reasonable but conservative figure.

[3]The rate for soldiers attending SL1 courses, from the DoD Per Diem Committee Web site.

hours require 13 eight-hour days. Thus, the NCO will spend 26 (43 – 17) more days at home station and could be available to his unit for a maximum of 13 (26 – 13) days. Minimum additional days come to 7, after making working-day calculations as previously discussed. When we convert these per-person figures to man-years, we use work-years for the last (lowest) measure to be consistent with our removal of weekend days.[4] The TDY cost savings is simply the saved residential days times the TDY cost factor ($30) times the student load, e.g., 26 × $30 × 170 = $132,600 or $133K. The process for the 31U course is analogous.

Table 4.1

Analysis of Artillery and Signal BNCOC

	Artillery (13B)	Signal (31U)
FY99 attendance	153 TDY and return 17 TDY en route 170 total	111 TDY and return 18 TDY en route 129 total
Original course length	43 days	77 days
New course length	17 days residential 13 days DL 30 total days	30 days residential 23 days DL 53 total days
Increase in available days		
Maximum	26 per person (4,420 man-days/ 12.1 man-years)	47 per person (6,100 man-days/ 16.6 man-years)
Maximum after allowing for DL time	13 per person (2,210 man-days/ 6.0 man-years)	24 per person (3,100 man-days/ 8.5 man-years)
Minimum	7 per person (1,190 man-days/ 5.0 work-years)	12 per person (1,400 man-days/ 6.5 work-years)
Estimated savings (lodging and per diem)	$133K	$182K

[4]As discussed previously, we use a figure of 240 working days for a working year. If we are using a measure—like our lowest measure here—that discounts weekend days, then it is appropriate to use a working-year factor that similarly discounts nonworking days.

Other TDY Professional Development Courses

Applying the same methodology to the other TDY professional development courses in the subset we looked at, we arrive at an overall man-year savings estimate of 2,138. As before, if we allow for DL study time, the available man-years are a maximum of about 1,040. Our minimum measure, using work-years, is about 730. The TDY savings would be about $23.4 million annually ($2,138 \times 365 \times \$30$). This is a steady-state savings estimate that will accrue only after all courses have been transitioned to a DL:RL mix; savings prior to that will naturally be lower.

Skill Level 1 Courses

Skill Level 1 courses are the Army's basic level MOS-producing courses, usually taken as the second phase of Initial Entry Training (IET). These courses are also used to re-educate soldiers who are changing skills (e.g., being reclassified), and it is this subset of course attendees that we examined. There were 98 courses in this category for which adequate data were available.

The potential effect of converting these courses is much smaller, though not insignificant, since the courses tend to be somewhat shorter, the DL component tends to be smaller because of a greater need for hands-on training and close supervision, and the number of students is smaller. On the other hand, use of DL as a preparatory module can enhance the value of the resident portion of the course, possibly allowing for that portion to be shortened further. In addition, the scheduling flexibility provided by DL and by the shorter residence requirements can expedite the reclassification process. The total TDY man-years saved are estimated at 235; the maximum man-years after allowing for DL study come to 114; minimum available work-years are 77. This leads to a savings estimate of about $0.9 million ($235 \times 365 \times \$10$). This is a relatively small savings, but in light of the stability enhancement and other benefits discussed here, we recommend that the Army continue to pursue use of DL to support SL1 courses when they are being used for reclassification.[5]

[5]For a full treatment of benefits accruing from DL-supported skill reclassification programs, see Shanley et al. (2001).

Short-Duration Courses

Similarly, the effect of converting short-duration courses is also smaller. In many of these courses, the prospective DL conversion reduces the RL TDY segment to as little as one day, which is unlikely to be cost-effective. Thus, options suggest themselves that remove the residential TDY altogether. It may be possible in some cases to provide the entire course using distance learning, if necessary with some synchronous interactive training with an instructor. For example, the Army Signal Center now offers completely by DL a course in information systems security for officers and NCOs assigned this function as an additional duty in their units. It may also be possible for some of these courses to have any remaining hands-on or certification requirement accomplished by a local instructor or certification authority, or one at a nearby installation (for example, an RC school).

In cases where full conversion to DL eliminates the travel requirement, the Army will save on round-trip transportation as well as on lodging and per diem payments. If all the courses in this category were to be converted in this manner, we estimate savings would amount to about $3 million annually.

Chapter Five

OTHER EXTENSIONS OF DISTANCE LEARNING'S POTENTIAL

We now turn briefly to a more general overview of some other potential benefits that could accrue from leveraging DL's potential. The benefits of distance learning are not limited to possible cost savings and increased time on station. Again we stress that the principal advantage of DL—an advantage with far broader application than professional military training and education—is the ability to deliver training efficiently in a manner that can be tailored to the student's individual needs in terms of timing, content, focus, and pace. While this feature would be beneficial in virtually any education scenario, it is even more valuable in today's environment of rapid technological growth, frequent deployments and other distractions of military personnel from assigned duties, and broader knowledge and skill requirements for leaders.

A common belief expressed in education literature is that continuous education is more valuable than education presented in packages at discrete intervals. The hypothetical ideal is one-on-one instruction presented by an expert tutor, as needed and when needed by the student. DL makes a near variant of this ideal feasible: DL can empower the student to focus on areas where either improvement or greater familiarity is required. With modest additional training resources, real-time or near-real-time feedback can also be provided. These general benefits of DL can obtain in virtually all applications: self-motivated and dedicated soldiers can exploit DL capabilities to improve their performance, add to their general education, and broaden their perspective.

MILITARY TRAINING BENEFITS

The ability of DL to provide training "on demand" is one of its greatest potential contributions. Trainers and educators in and out of the military services have explored and begun to exploit the potential of paper-based and CD-based job aids. Web-based distance learning goes further, enabling training proponents to (1) deliver training more responsively (instantaneously, for asynchronous training); (2) update materials; and (3) monitor the usage and usefulness of their offerings. Job aids in any of these forms can be used to provide "just in time" skill training. This is likely in many cases to be more useful than more formal residential training, which involves waiting for a scheduled opening and then a protracted absence from assigned duties. This feature can be particularly helpful in cases where NCO leaders are serving above their pay grade. It will also be helpful in preparing officers to serve in their selected specialties (functional areas), as well as in keeping them current in their functional areas and more generally in their profession.[1] DL similarly makes refresher training more readily available, and this has important implications for an Army increasingly dependent on skills that can quickly become outdated because of technological developments.

DL can offset the need for institutional training to support skill transitions from legacy to modernized equipment. The pace at which technology evolves makes it largely impractical, if not completely infeasible, to employ residential training to keep skills fully up to date in many technical specialties. In addition, military modernization and equipment procurement schedules can move so rapidly that soldiers and leaders find themselves needing to deal with a new generation of systems (or new systems altogether) when they move from one location to the next—and frequently even before they move. While technical libraries, telephone assistance lines, and mobile training teams can help the field upgrade and adapt the skills

[1] The Army's field grade officers serve either in their branch (e.g., armor, infantry) or in one of many specialties ranging from information management to strategic intelligence to operations research. DL certainly will not be able to supplant all or even most of the formal education needed to prepare officers in these specialties, but it can help.

of its people,[2] DL can accomplish the same requirements—or a substantial portion of them—more rapidly and more efficiently.

The military services are all to some degree developing training support capabilities in which the proponent for each technical skill maintains a Web-based course covering all aspects of the skill that can reasonably be taught using asynchronous techniques. This would enable "just in time" training for soldiers who need their skills updated, either because of a job change or because of a new item being fielded. This capability would need to be backed up by instructors available by telephone or e-mail to provide additional assistance. In those cases where hands-on training is still required, mobile teams, locally certified instructors, or supplemental residential training will be needed, but DL can clearly reduce these requirements. It can also better prepare students to engage in hands-on training, making that training more efficient when it is delivered.

Along the same lines, "just in time" training can facilitate the acquisition of supplemental skills needed by some selected leaders, both officers and NCOs. We have in mind here the skills required to perform what the military services commonly call "additional duties,"[3] including safety, physical security, environmental protection, load and movement planning and execution, information systems security, and ranging even into realms like tax and voting assistance. Many of these supplemental skills can be largely taught using asynchronous DL (or even completely taught, e.g., tax assistance and information systems security).[4] Most Army installations have a

[2]We do not envision the disappearance of hotlines and mobile instructors, but DL should be able to reduce the need for these more expensive approaches. We also believe that Web-based look-up resources, because of their more universal accessibility and the relatively lower cost of keeping them up to date, will largely replace technical libraries. TRADOC's digital library, which offers manuals, publications, graphic aids, and partial on-line access to selected course materials, receives in excess of 2.5 million hits per week.

[3]Officers and NCOs assigned these additional duties are not meant to be sophisticated subject matter experts. They are expected to understand the basics needed in each supplemental duty. This basic understanding is supposed to be sufficient to enable them to supervise and direct the unit in accomplishing routine tasks relevant to the duty, to inspect and evaluate the unit's preparedness to perform those tasks as required, and to know when, where, and how to request more expert assistance.

[4]The Army's Signal Center currently offers a DL course in information systems security, aimed at producing the skills needed for someone assigned this additional

locally available course for many of these additional duties; DL could supplement or largely supplant those courses, providing the additional advantages of standardization and ease of scheduling. The latter would be a boon to the Army's operational units. In many cases, training events and deployments include a requirement for a unit to have an officer or NCO certified in one or more additional duties (e.g., safety, preparation of air or rail car loads). More flexibility in scheduling—more readily available training—would obviously make it easier for units to replace these people when they rotate.

It should also be possible to employ certain forms of "just in time" training to meet some unit training requirements. For example, units being deployed to a given region need some basic familiarity with the characteristics of the people, geography, climate, and inherent dangers of that region. But they don't need that familiarity until they are about to deploy there: "just in time" DL can make that aspect of deployment preparation easier to accomplish.

The benefits of informal learning at home station also include the possibility that the materials and training could be shared informally with other members of the home unit or organization. CD-based job aids have already been used for unit training; Web-based exercises and training sessions (e.g., for staff or staff subelement training) could easily take their place, offering greater interactivity and updating capability. This would also be a way to capitalize on the DL phase of professional development courses. For example, an officer or NCO slated for attendance at an officer advanced course or ANCOC could use some of the DL materials to present a class or run a short seminar for members of the unit. This individual would thereby get practice in presenting training, learning the material himself (thus completing part of the DL requirement), and simultaneously contributing to unit training.

GENERAL EDUCATION BENEFITS

We have so far focused on the potential for DL to enable more efficient acquisition of needed military and technical skills. A less obvi-

duty, typically on a brigade or battalion staff. It is entirely asynchronous, with an instructor available on a help line. It has so far trained more than 2,000 people.

ous and largely untapped potential is for DL to help the military services in raising their general levels of education. The more complex and diverse missions faced today by our military services put a greater premium on general education, requiring more than ever that leaders have a broad perspective, a fuller understanding of the world environment and its historical context, and knowledge of civilian institutions. The growing complexity of potential missions and of the technology employed to accomplish them increases as well the need for well-developed decisionmaking and critical thinking skills, both of which can be enhanced through education. At the same time that requirements appear to be growing for a more highly educated officer and enlisted force, resource constraints and conflicting time demands are making education more difficult to achieve.

Traditionally, the military services have provided only professional military education for their enlisted personnel; civil schooling has been expected to occur as part of professional self-development, on the service member's own time. Today's operational pace and the accompanying greater frequency of deployments make it more and more difficult for service members to find the time (or, more to the point, a long-enough uninterrupted span of time) to take advantage of traditional residential instruction offered at universities, colleges, and local institutions.

The situation is similar for officers, although in the case of officers we are dealing with more advanced degrees—mostly masters' and a few at the doctoral level. Historically, officers enter their service with a bachelor's degree and some basic military education; subsequently they receive professional military education at discrete intervals, and some are selected for full-time funded attendance at civilian academic institutions to study for advanced degrees. The rest attain advanced degrees on their own, if at all. This approach may not be adequate to the demands of today and tomorrow. The military's need for officers with advanced education is increasing, and—as with the enlisted force—the operational pace and frequent deployments make it more difficult to find time to take courses leading to an advanced degree.

Distance learning has significant potential to help the military services overcome the challenges summarized above. It can deliver education in smaller packages and provide access to educational

materials for students at dispersed military bases and deployed locations. These packages are usable when and where the student can find the time to take advantage of them; they are thus innately easier to schedule. Also, by reducing the importance of geographical separation in the selection of educational institutions, distance learning will serve to make the entire process of offering education more competitive for those offering it.[5] This in turn will increase the leverage available to the military services and their members as customers, making it possible for them to receive higher-quality education at the same or lower costs. Some programs to achieve these ends are already under way. For example, the Army is developing its University Access Online program with the expectation that it will aid recruiting and retention; that is, by making educational goals more achievable while a soldier is serving, the Army hopes to increase the propensity to join and decrease the propensity to leave. We expect that this program when fully implemented will make education more available throughout the force, including elements that are deployed. Similarly, sailors worldwide can access the Navy College Program.

While we do not believe distance learning can fully supplant residential instruction in civilian education any more than it can in military training, it can significantly reduce the need to send service members to blocks of residential instruction and thus aid the overall process of raising education levels. Much remains to be learned about the costs and benefits of different ways to capitalize on distance learning in this regard. Answering the numerous questions that have and will continue to come up will require an extensive effort by the Department of Defense, the military services, and the civilian academic community. The result of this effort can well be a cost-effective program for improving general levels of education throughout the military services, despite the challenges of resource constraints, operational pace, and deployments.

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[5]This, again, is an observation with implications that go well beyond the education of military service members.

Chapter Six

CONCLUSION

SUMMARY OF STABILITY ENHANCEMENT FINDINGS

Converting portions of the Army's resident courses to DL clearly makes soldiers more available to their units and, in most cases we considered, to their families as well. The total increase in on-station man-years is between 2,700 and 2,800, or about 13 to 14 percent of the estimated 20,000 man-years devoted to the types of courses considered in this analysis. Man-years available for unit duties are of course less, on the order of about 900 working man-years, reflecting allowance for completing DL work at home station.

Our analysis points to retaining current patterns for officer career courses, with appropriate shortening of the residential advanced course phase as DL conversions make that possible. Potential PCS savings would be more than offset by increased TDY costs if these courses were shifted to a TDY mode, and the family impact of increased separations would be significant.

Courses that are already conducted in a TDY mode show significant potential for decreasing the time soldiers spend away from home and from unit duties, with modest but unambiguous savings potential as well.

We note again that our estimates are conservative. Also, there are additional courses with DL conversion potential not reflected in our estimates; including these courses would add both to our TDY savings estimates and to the estimates of additional available days. Finally, with regard to savings estimates, it should be noted that we did not attribute savings to the additional available duty days, since

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we counted these days as being given back to the units from which the soldiers were absent. We believe this approach is consistent with current Army efforts to improve readiness by making more soldiers available to units.

CONCLUDING REMARKS AND RECOMMENDATIONS

We conclude with some observations on the viability of DL-supported training and education options and some reservations concerning implementation. First, as we have noted repeatedly throughout this report, TADLP has considerable potential to leverage technology in ways that are advantageous to the Army. In particular, we have demonstrated that DL can, by moving training to soldiers' home stations, reduce education-related separations from units and families, and that by and large this can be done at comparable (for PCS courses) or lower (for TDY courses) costs. We have also pointed out other important ways in which DL can help: making truly continuing education an achievable goal, featuring focused segments that can be tailored to individual or unit needs, providing introductory or refresher short courses for additional skills, supplementing staff and individual development programs at unit level, and the like.

But DL is not a panacea for the Army's many training challenges. Care must be exercised in selecting course segments to be taught using DL—much of the training the Army needs to conduct is simply not amenable to this technique. For those skills that can be imparted using DL, training planners must realistically assess the time needed to do this—and the Army must ensure that soldiers have this time made available to them. This probably means providing for dedicated ("fenced") time and may require a training policy letter describing the requirement to make such provisions. Many officials we have talked to, in TRADOC, the field, the schools, and the Pentagon, have stressed that this will require something amounting to a culture change in the Army's units. In any event, course scheduling will remain an item of interest for students, training managers, and commanders; if anything, DL programs make close coordination and timely use of ATRRS even more important.

It will also be important for the Army to avoid premature confidence in any major savings estimates. In particular, we caution against planning on large PCS savings. DL will not reduce PCS moves unless

an independent decision is made to convert courses from PCS to TDY. Even in those cases where moves might be reduced, any savings will be largely or completely offset by increased TDY costs. Further, converting long courses to TDY mode will add more family separations. Finally, our overall estimates of eventual savings are based to a significant extent on DL conversions that have not taken place and will not occur until the Army has worked through its conversion schedule.

The Army will find it fruitful to continue detailed monitoring and study of the costs associated with TADLP and overall institutional training, including some of the factors used in our analysis, but also extending to school resources—instructors, support, training materials, courseware development and maintenance, and longer-term facilities and other capital costs. Our previous DL research supports the finding of TADLP's economic analysis that these costs—even when considering only the portions of them associated with DL—are considerable. It will also be helpful to conduct a separate study to determine more specific categories of PCS costs. This will enable better analysis of policies that would affect only one segment or another of the Army's people.

Consistent with our analysis and the reasoning above, we offer the following general recommendations:

- Develop DL pilot programs for the advanced course portions of one or more AC career courses; monitor costs, savings, training effectiveness, and other benefits.
- Emphasize developing courseware early on for TDY professional development courses that appear to have larger stability and savings payoffs. This means looking particularly at courses that have higher TDY costs, longer residence requirements, larger DL conversion factors, or a combination of these features.
- Engage in a continuing examination of DL's effects on the overall costs, benefits, and effectiveness of institutional training programs.
- Look more broadly and more thoroughly at ways in which the Army can capitalize on emerging DL technology.

The Army's long-term plan for distance learning can capture the potential benefits we have discussed in this report. As is the case with any program of this nature, careful monitoring is required from the beginning to assess the degree to which planning assumptions are holding true and goals are being met. Our research should help both to illuminate the potential areas for success and to identify areas in which problems can occur.

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